PARTIRE DA QUI

adat®

8 TRACK PROFESSIONAL DIGITAL AUDIO RECORDER

Service Manual

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ALESIS
STUDIO ELECTRONICS

TO: Authorized Alesis Service Centers

FROM: Glenn Buckley

DATE: February 18, 1993

RE: ADAT Service

The Service Manual included in this package is a preliminary one only. Alesis is currently updating it in a much more comprehensive and detailed manner. When this updated version is complete, I will send it to you as a replacement for what you have just received.

What we are sending you is most of the original one and the Maintenance, Repair\Troubleshooting, and Test procedures section of the newer version.

Most of the work you will be performing is detailed in the newer sections and this is the reason that the preliminary version of this has been released to you at this point.

Please read through it carefully, and in its entirety. There are some sections that may apply to you at this point and some that may not. However, we feel that it is important to give you as much detail as possible in order to gain the best understanding of the unit as possible.

Please note that if you have any questions regarding the service of ADATs, or a specific one that you have in your possession right now, please feel free to call myself or John Sarappo. We are able to assist you technically on any issue.

Best regards,

Glenn Buckley
Customer Service Manager
Alesis Corporation

ADAT Service Manual Memo

Heads and Drums: It is worth mentioning that contact of anything, including your skin, will permanently damage the heads. The helical groove on the lower drum is also very susceptible to damage from physical contact of anything. Therefore, please use extreme caution when approaching the entire headstack for any reason.

All head stack assemblies (as well as other assemblies) that you receive from the factory have been thoroughly tested immediately prior to us shipping them to you. For this, we can assure maximum quality and reliability of these assemblies. However, if you notice any damage to the package that you receive these parts in, please notify the carrier immediately and file a claim.

The rotary heads, upper drum, Read Preamp 1 PCB assembly, Write Preamp PCB assembly and lower drum are not individually replaceable, just the entire head stack assembly. Please familiarize yourself and your appropriate staff with this procedure as well as the alignment procedures and precautions that are specified in the accompanying ADAT Service Video and Service Manual.

Also remember that in order to obtain additional parts for warranty replacement, you must first return the defective ones, properly packaged, along with your completed Warranty Claim Form,. and attach a note explaining the nature of the fault.

All parts orders must be mailed or faxed to Alesis. Parts orders will not be accepted over the phone.

Important Alignment\Calibration Tape Information and Precautions

These tapes are precision recorded at the factory. It is *not* possible to digitally duplicate them using 2 ADATs. (Actually it is, however, the duplicate will not work). Each tape's width must be precisely defined and found to be within a tightly specified thickness in order to become a calibration tape. The individual vital statistics for each tape are printed on the label of it. Please do not remove or deface this information. If you have any problems or difficulties using it, we may require this information. Also, please keep the tape in the supplied protective cover at all times when not in use.

The following will explain both the numbers on the outside of the alignment\calibration tape and what to look for as well as what to do in the event of a tape failure.

The 2 voltages designated on the label of each alignment\calibration tape are to be used to check proper functionality of the ADAT Read Head System, mechanical and electrical.

These voltages are carefully measured for each individual alignment\calibration tape on an Alesis standard reference unit.

These values are the minimum allowable Read Head amplitudes for that specific alignment\calibration tape for both PG High and PG Low Head respectively. Therefore, if after attempting alignment, the playback amplitude is too low, there is probable a problem in the playback portion of the ADAT. (e.g. dirty heads, faulty heads, faulty Read Pre 1 (between drum and lower headstack assembly), Read Pre 2, cabling, etc.), where it would only be pinpointed with further in-depth troubleshooting.

It should also be noted that the voltages were taken immediately after developing the alignment\calibration tape. Theoretically, these voltages should be accurate for the entire life of the tape. In reality, these voltages may decrease over varying periods of time due to a number of factors. These include frequent tape use, tape damage (such as abuse or scarring of the tape edge), loss of magnetic tape particles, etc. If it is suspected that the voltage reading for a particular alignment\calibration tape is no longer valid try using a second, known good alignment\calibration tape on the same machine and compare values.

To replace expired tape, consult your service contact at Alesis, or the Customer Service Manager.

August 29, 1992

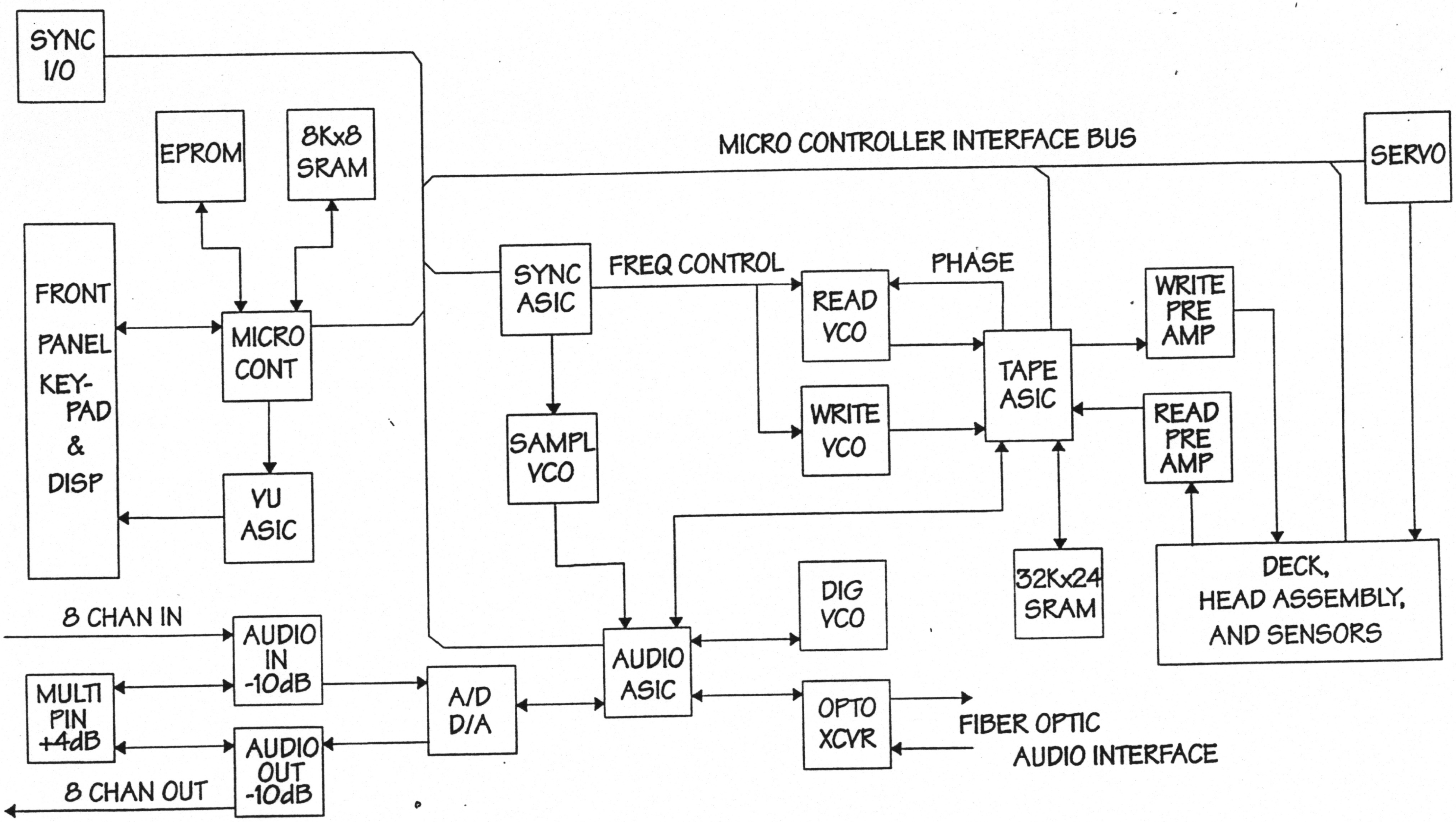
ADAT SERVICE MANUAL NOTES

REV 1.01

The Alesis ADAT is an unusually simple, completely self contained digital multitrack tape recorder. Much of its simplicity is owed to the extensive integration found in the four Alesis custom VLSI chips that handle the complex data manipulation requirements. Also, the deck requirements are significantly streamlined by relying on the readily available and time proven VCR mechanism. Additionally, the thoughtful construction lends itself to easy access to key areas needed for troubleshooting inquiries.

This document, along with a tutorial video, is intended to serve as a primer to assist repair technicians in isolating and correcting problems that may be encountered in the field.

ADAT ELECTRONIC BLOCK DIAGRAM



ADAT Block Diagram Description

The ADAT is remarkably simplistic and lucid in its electronic flow chart, as well as its actual circuit implementation.

The 8031 micro controller, along with its support circuitry directs detailed traffic flow, from user interface to deck and custom IC control. The 8031 while scanning the front panel buttons determines just what has been requested and then acts on this information. It also manipulates all front panel LEDs through the VU ASIC which carries out the multiplexing lighting tasks.

The Sync I/O board accommodates the master and slave interfacing that allows multi-unit synchronization. It is also host to the foot switches as well as the remote meter bridge connector.

The audio is routed through either the -10dB audio in/out PCBs or the +4dB multipin connector depending on the application. From here the analog or digital conversion process is carried out on the A/D/A PCB which is interfaced to the Audio ASIC. Here data is aligned to accommodate the Tape ASICs protocol so that it can be off-loaded to tape.

A round trip for audio data processing would be as follows: Receive analog audio, perform analog to digital conversion, store all eight channels in the Audio ASIC, transmit digital audio to the Tape ASIC, encode the data so as to provide Reed Solomon redundancy, write the data to tape, retrieve data from tape for the Tape ASIC to prepare it for playback, perform error correction as necessary, transmit data to the Audio ASIC, align stored data and transmit it to the digital to analog converters, output the analog audio data.

The Sync ASIC serves a dual purpose. It compares master and slave time codes, and with micro controller intervention allows multiple machines to achieve sample lock. It also prescribes the frequency of the read, write, and sample VCOs.

The read and write VCOs clock the Tape ASIC's data off loads and extraction from tape processes. The Tape ASIC phase aligns the read data by sampling the VCO with each channel transition, and supplying error correction information to the read VCO. The sample VCO clocks the Audio ASIC which in turn clocks the sample process in the Tape ASIC. While processing data to and from tape, the Tape ASIC employs three 32K x 8 SRAMs to manage its data storage requirements.

The digital VCO is controlled by the Audio ASIC. This is accomplished by using an algorithm that extracts the sample rate from the fiber optic's digital transmission.

The drum and capstan motors are controlled by the servos which utilize sample rate information and motor feed back to achieve system stability. The thread and load/eject motors are under the micro controllers direction. All of the deck's sensors are read by the micro controller, and it is this information that allows it to correctly manipulate the cassette and tape handling routines.

4.0 MAINTENANCE

This section describes the methods and processes associated with the repair and checkout of ADATs by service technicians in the field. Maintenance incorporates the necessary steps to ensure proper quality control of the unit after a problem has been resolved. Tape path alignment, QC test procedures and the like will be discussed in this section so the service technician can optimize the performance of the ADAT prior to its return to the customer. Although this section details some of the issues associated with ADAT quality, it is not intended to be used as an in depth troubleshooting guide. For that list, refer to section 5 of this service manual.

4.1 Maintenance Philosophy

The following maintenance philosophy is implemented for all service centers.

4.1.1 Foreign Service Centers

For service centers located outside the United States, the maintenance philosophy should be as follows:

- Troubleshooting of all problems down to the component level, if possible. This includes socketed ASICs and other devices, ICs, passive components and discrete active components.
- Replacement of all transport parts is acceptable except for the rotating headstack which must be replaced as an entire assembly.
- Replacement of PCB's only if the problem can not be found within a reasonable amount of time.
- Replacement of head assemblies if any problems are found relating to errors, mechanical noise or low envelope amplitude.
- Replacement of all internal cable assemblies is acceptable.

It is intended that a normal ADAT repair will take between 1-3 hours. This includes the conduct of the QC Test Procedure detailed in Appendix E.

4.1.2 Domestic Service Centers

For service centers inside the United States, the maintenance philosophy is as follows:

- Troubleshooting of problems down to the board level. However, ASICs and other socketed ICs can be replaced without the replacement of the entire PCB.
- Replacement of transport parts is limited to motors, tape guides, tension bands, end sensors and impedance rollers.
- Replacement of head assemblies if any problems are found relating to errors, mechanical noise and low envelope amplitude.
- Replacement of transports if any problems are found relating to brake torque.
- Replacement of all internal cable assemblies is acceptable.

It is intended that a normal ADAT repair will take between 1-2 hours. This includes the conduct of the QC Test Procedure detailed in Appendix E.

4.2 ADAT Repair Kit

In order to work on the ADAT with the greatest amount of success, the proper tools and ancillary equipment are essential. Table 4.1 lists the items that make up a simple ADAT Repair Kit. Some of the items listed are provided by Alesis, others are readily available from Alesis or the source manufacturer and a few need to be made by the service center. It is assumed that all service centers are equipped with a standard tool kit, including screwdrivers, wire cutters, pliers, needle nose pliers, soldering stations, and the like.

The items which require fabrication at the Service Center are listed in the paragraphs following Table 4.1.

TABLE 4.1 - ADAT REPAIR KIT

Item	Manufacturer and Model
Oscilloscope	Tektronix Model 465B or equivalent*
Tension Gauge	Tentel Model T2-H2-UM or equivalent
Torque Gauge	Tentel Model TQ-80 (Supplied by Alesis)
Reference Plane Gauge	Tentel Model TSH-V5 or equivalent (optional)
Allen Hex Socket Driver size 8-32 (Front Panel screws)	Xcelite or equivalent
Allen Hex Socket Driver size 10-32 (Read Pre-2 screws)	Xcelite or equivalent**
Allen Hex Socket Driver size 5/16 (EMI Filter Nut)	Xcelite or equivalent
Hollow Shaft Nut driver size 15mm (1/4" jack plastics nuts)	Xcelite or equivalent
Hollow Shaft Nut driver size 3/16 (Sync PCB 9 pin nuts)	Xcelite or equivalent
Hollow Shaft Nut driver size 1/4 (standoffs and heat sinks)	Xcelite or equivalent
PLCC removal tool (ASIC removal)	
9 pin male to 9 pin male cable (for sync I/O)	Straight 1 to 1 connection
Plastic screwdriver for all adjustable pots on Processor PCB	
L2, L3 adjustment tool	
P2, P3 adjustment tool	Provided by Alesis
Linear head adjustment tool (also for P1, P4 adjustment)	Provided by Alesis
Alcohol	91% Isopropyl Alcohol
Three Bond	Three Bond 1401B
Lint free cloth	Tech wipes or equivalent
Cotton swabs	
Alignment Tape	Provided by Alesis
Tension Tape	See Section 4.2.1
Short Tape	See Section 4.2.2
Digital I/O Test Tape	See Section 4.2.3
Audio Test Tape	See Section 4.2.4
Unbalanced audio cable snake	See Section 4.2.5
Balanced audio cable snake	See Section 4.2.6

Notes:

* - An Oscilloscope with the "B Delay" function is required in order to make precise measurements of the PG Delay Offset and Envelope Offset.

** - Some of the older units used an Allen type nut instead of a Phillips head screw in order to mount the Read-Pre 2 PCB to the standoffs on the Processor PCB.

4.2.1 Test Tapes

Various tapes are required for the proper repair of ADATs. The Alignment tape is supplied by Alesis, but the tapes listed below must be fabricated by the service center. Note that the text refers to small hub and large hub cassettes. A small hub cassette is any standard T-120 cassette. The use of T-160 cassettes (which is also a small hub cassette) is not recommended for ADAT repair and checkout. A large hub cassette is any standard T-60 cassette.

4.2.1.1 Tension Tape

A tension tape is made by formatting a small hub cassette on a unit with KNOWN GOOD TENSION. It has been found that a tape made this way will not yield erroneous results when used to check tension. This is especially important at the end of the tape, where slight errors in tension are magnified. A tension tape will usually last for 50 passes or until tension related problems begin to appear.

4.2.1.2 Short Tape

A short tape is made by removing 38 minutes of tape from a formatted small hub cassette. Cut the tape at the 2:00 minute mark, remove the excess tape, and splice the tape to the tail leader. Scotch tape can be used to splice the tape together. The short tape will end up as a small hub cassette with the original "LEAd" and "dAtA" sections, plus two minutes of recordable tape. When completed, remove the write protect tab from the tape. Any expired tension tape can be used to make a short tape and its life is unlimited.

4.2.1.3 Digital I/O Test Tape

A Digital I/O Test Tape is made by recording an audio source on tracks 1 and 2 of a small hub cassette. All other tracks of the tape should be blank. In addition, the audio level on track 1 should be purposely recorded higher or lower than track 2 (±3dB). The level difference is especially useful when visually inspecting the LED meters during the Digital I/O Self Test.

4.2.1.4 Audio Test Tape

An Audio Test Tape is made by recording an audio source on all 8 tracks of a small hub cassette.

4.2.2 Unbalanced Audio Cable Snake

This is a cable snake used to test the unbalanced (-10dBV) inputs and outputs of the ADAT. The ADAT requires 1/4" plugs for unbalanced audio. Up to 8 inputs and outputs can be included, but at least 1 input and output cable is required. Terminate the other end of this cable with the appropriate connectors for the audio source which will be used by the Service Center. This audio source should be unbalanced as well.

4.2.3 Balanced Audio Cable Snake

This is a cable snake used to test the balanced (+4dBu) inputs and outputs of the ADAT. The ADAT requires a 56 pin male ELCO connector for balanced audio. All 8 inputs and outputs must be wired into the ELCO connector. The pin out configuration of the ELCO connector is shown on the back panel of the ADAT and in the ADAT Reference Manual. Terminate the other end of this cable snake with the appropriate connectors for the audio source which will be used by the Service Center. This audio source should be balanced as well.

4.3 Alignment

NOTE: The rotary heads have been precision aligned at the factory prior to insertion into the ADAT. Contact of the heads with anything, including your skin, may permanently damage them. The helical groove on the lower drum is also very susceptible to damage from physical contact of anything. Therefore, extreme caution must be used when approaching the headstack for any reason.

Tape path alignment is the process in which adjustments are made to mechanical parts within the transport to maximize tape travel and envelope amplitude. Research indicates that proper tape path alignment is essential to prevent the tape damage and/or errors from occurring. Proper tape path alignment also eases the interchange of tapes between ADATs of a multiple ADAT system.

Proper tape path alignment must be verified on every ADAT serviced. Moreover, if the tape path alignment is not set correctly, chances are that the unit will be returned for further servicing. As more and more ADATs are serviced, it soon becomes commonplace to set up the proper tape path alignment. That is to say, practice makes perfect. Although no two ADATs have the exact same transport characteristics, several guidelines have been developed to bring all ADATs within a specific tolerance level.

Essentially, tape path alignment is a function of brake torque, tape guide positioning, tape tension, linear head adjustment and envelope maximization. The order of these settings is important but not critical. However, common sense indicates that tape tension is checked only after the proper positioning of the tape guides is complete. This is because tape tension is dependent upon the position of the tape guides (for example, if they are too low or too high, friction results and therefore the tension becomes greater).

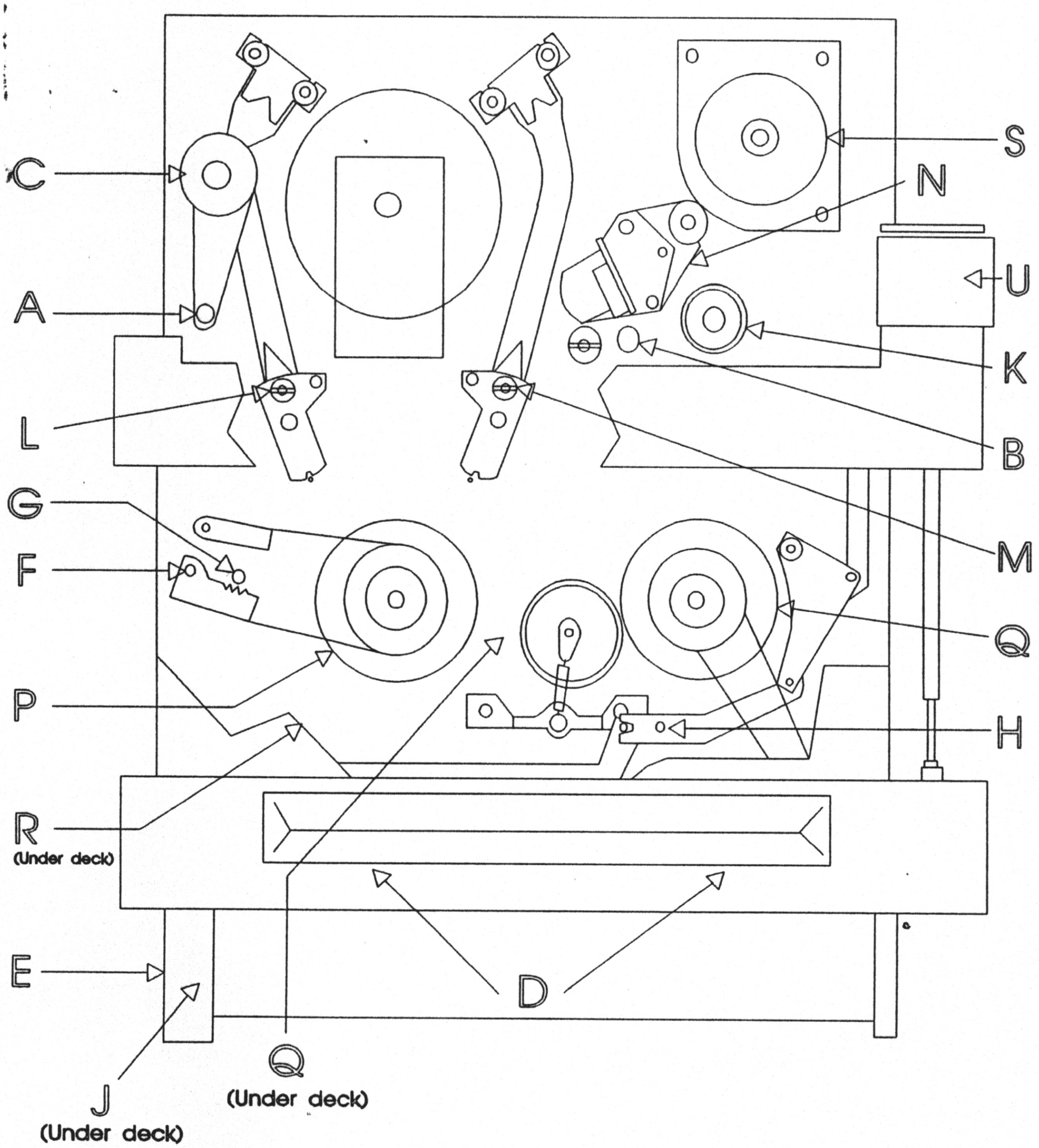
Figure 4-1 is a top view of the transport assembly. The tape guides and other components are labeled for ease in their description. When aligning the tape path, these labeled items will be referred to by the text. Please refer to the ADAT service video in addition to the text below for additional information on tape path alignment.

4.3.1 Brake Torque

Brake torque is the measurement made by the service technician to verify the proper operation of the ADAT brake circuitry. If the brake torque is too low, tape damage may occur due to a slow braking action. Likewise, if the brake torque is too high, then tape may be stretched by a sudden and immediate locking of the hub when the tape is stopped.

As an example, suppose the take up reel brake torque is below specification and the supply hub torque is above specified limits. With tape engaged inside the transport, the unit is put into rewind mode and then the stop button is pushed. The lack of proper braking at the take up hub when the transport is stopped may cause tape to wind off the take up reel and wrap itself around the pinch roller. Not a pretty sight. The tape is then disengaged from the transport and the excess removed from the pinch roller (with diligence) by the service technician. The unit is now put into fast forward mode (to collect all the excess tape still lying in the transport) and then stopped. The sudden and immediate locking of the supply hub may cause the tape to stretch as the supply hub comes to a screeching halt. The tape is now ruined.

Figure 4-1 - ADAT Transport Top View



The above example is a worst case scenario. Nevertheless, it stresses the significance of setting proper brake torque for the ADAT being serviced. It is important that each ADAT's brake torque be checked prior to beginning the alignment procedure. This is simply because any adjustments made to the brake torque or brake solenoid will require the service technician to recheck tension and alignment from the beginning.

The brake circuitry is located at section B4 on page 1 of the Processor PCB schematic. For US service centers, see the attached circuit diagram. Prior to checking for brake torque, the service technician must first verify that the brake resistors R32 and R51 on the Processor PCB are at least 180 ohms (nominal 220 ohms) and that the EPROM located in U5 on the Processor PCB contains V3.01 software or later. The new braking action found in V3.01 software and later versions is a "softer" and "smoother" braking. If an ADAT arrives for servicing which contains an earlier version of software, it will be necessary to update the EPROM to V3.01 or current version. Additionally, brake resistors R32 and R51 must be replaced with 220 ohm counterparts prior to beginning alignment. Refer to Appendix B for details on updating ADATs.

Appendix E details the steps required to measure brake torque. For V3.01 software and later versions, the brake torque should be between 50 and 70 grams-cm. If the brake torque is too low, the service technician can replace R32 (supply reel) or R51 (take up reel) with a lower value resistor until the torque is within the specified limits. However, if a resistor value of less than 180 ohms has to be installed in order to obtain the proper brake torque, it is usually an indication of a problem that may exist with the brake solenoid itself. At this point it is recommended that the brake solenoid be replaced, the brake resistor changed back to 220 ohms and the brake torque rechecked. Consult section 5.1.8 for information on replacing the brake solenoid. (Foreign Service Centers Only)

Should there be no brake torque on a reel and the brake circuitry seems to be in order, then the brake solenoid shaft may be bent. This condition prevents the solenoid from properly aligning the pads inside the brake. The shaft can be straightened with a hollow nut driver as long as the tool can get way down into the base of the shaft. The white shims and washers must be removed to get to the base of the shaft. When this solution works, brake torque will be present. However, if this solution is unsuccessful, the solenoid will have to be replaced.

4.3.2 Tape Guide Positioning

P1 and P4 are stationary tape guides. P1 (Point A of Fig. 4-1) guides the tape from the supply reel of the cassette to the entrance of the rotating head. Likewise, P4 (Point B of Fig. 4-1) guides the tape from the linear head path to the take up reel of the cassette. Proper positioning of these guides will prevent tape damage and/or high tape tension from occurring. Appendix E details the steps involved in the proper setting of P1 and P4.

When setting P1 and P4, pay particular attention to the cautions listed below:

1. If the P1 post is screwed too far down, it will prevent the impedance roller from moving freely.
2. A white cap sits on top of the P4 post. The function of this cap is to lift the protective cover of the cassette away from the tape while it is inside the transport. When an adjustment to P4 is required, the white cap must be removed. Following the adjustment, it is important to verify the P4 position after the white cap has been replaced. Any pressure and/or twisting applied to the P4 post while re-installing the cap may throw it out of position.

3. If the tape suddenly stops when light is focused into the transport, the light may be affecting the tape end sensors, causing them to think that no tape is present. Reposition the light so the transport controls function properly and you can get a good look at the P4 post at the same time.

4.3.3 Tape Tension

Proper tape tension is crucial to proper tape path alignment. Empirical analysis indicates that as much as 75 per cent of all problems relating to data errors are resolved by the proper setting of tape tension. Tape tension is dependent upon many factors, including brake torque, drum FG, cap FG and capstan/pinch roller gap. Appendix E details the steps required to properly set this parameter.

In order to set tape tension, the service technician must have a tension gauge and tension tape available. Section 4.2.1 describes the method of creating a tension tape. **DO NOT USE A LARGE HUB TAPE TO CHECK TENSION AS ERRANT MEASUREMENTS WILL RESULT!** The tension gauge should be checked for accuracy every day but seldom requires calibration if stored properly in its case. If calibration is required, refer to the manufacturers' guidelines.

Prior to checking tape tension, the drum FG and cap FG voltages must be set to 2.5 volts to ensure proper servo operation. Moreover, the capstan/pinch roller gap must be set within its specified range. For instructions on setting the proper capstan/pinch roller gap, drum FG and cap FG, refer to Appendix E of this service manual.

Tape tension is measured at two locations on the tape path: prior to entry into the rotating headstack and following exit from the rotating headstack. The first measurement is critical while the second is for reference only. However, if the tape tension at the exit of the headstack is too high, it may indicate some other problem related to tape path alignment.

The specification for tape tension is summarized below:

1. With the tape running at normal speed in PLAY mode, at a time between 18-20 minutes as shown on the front panel display, the nominal tape tension at a point prior to the entrance of the tape into the rotating headstack should be between 23-27 grams. A fluctuation of 3 grams is acceptable.
2. With the tape running at normal speed in PLAY mode, at a time between 38-40 minutes as shown on the front panel display, the nominal tape tension at a point prior to the entrance of the tape into the rotating headstack should be between 30-35 grams. A fluctuation of 5 grams is acceptable.

What does all this mean? Essentially, it states that even minor fluctuations in tape tension can lead to future problems. This specification has been developed following extensive research and empirical study of tape tension on a large number of ADATs. It is felt that tape tension set between these two limits yields a superior envelope amplitude, a minimum of errors and no tape damage.

4.3.3.1 Excessive Variance Of Cap FG Signal

Monitoring the cap FG signal on an oscilloscope is often a good method of verifying proper tape tension. When the cap FG signal is set to 2.5 volts as described in Appendix E, a variance of the oscilloscope trace at the transition between PG High and PG Low is usually observed. The normal variance can be as much as 0.5 volts above and below the nominal setting. Should the variance be more than the amount mentioned above, then tape tension is not set properly. This is especially noticeable at the end of a tape. The following paragraphs describe some of the methods the service technician may attempt in order to get the Cap FG signal within its specified range.

1. Perform a rough alignment on the unit by following the procedures described in Appendix E. Sometimes, the P2 or P3 assemblies are not adjusted correctly which can lead to tension problems. After the rough alignment is finished, recheck tape tension.
2. Verify that the white rollers on the P2 and P3 assemblies are spinning freely. If not, replace the affected assembly, perform a rough alignment and recheck tape tension. Refer to section 5.1.6 for details on replacing the P2 and P3 assemblies.
3. Verify that the capstan/pinch roller gap is set correctly. Refer to Appendix E for details on setting this gap. Note that the gap should be between 0.7 and 1.0mm. However, research has found that the variance of the cap FG signal is reduced when the gap is set closer to the 0.7mm limit.
4. Verify that the tension spring which connects the tension band arm to the thread motor is hooked at the left most position of the Thread Motor.
5. Remove the tension band and visually inspect it for creases. Caution must be used when handling the tension band because they can develop creases very easily.
6. Check to see if either the supply hub or take up hub is warped. This can be accomplished by observing the respective hub while spinning it by hand in a clockwise direction. For the supply hub, the friction pad and tension band should be moved away from the hub so that it spins freely. For the take up reel, the O ring which turns the Tachometer wheel should be removed prior to spinning. If a hub is warped, replace it and recheck tension. See section 5.1.8 for details on replacing hubs.
7. Verify that the brake solenoid shaft is not bent. This can be accomplished by removing the hub and moving the shaft from side to side. If there is a lot of lateral movement, then the shaft may be bent. Compare the lateral movement to that of a known good unit. If the movement is greater than expected, replace the entire brake solenoid. Remember to recheck the brake torque of the new brake solenoid as well as rechecking tape tension. Refer to section 5.1.8 for details on replacing the brake solenoid.
8. Replace the white impedance roller located to the left of the drum assembly between P1 and P2 (Point C of fig 4-1). Make sure that the new roller has an equal amount of vertical movement as the original. Make sure that the replacement roller is properly lubricated prior to installation. It will be necessary to readjust P1, and then recheck tape tension after the new roller is installed. Refer to section 5.1.4 for details on replacing the impedance roller.
9. Verify that the pinch roller is not warped nor contains debris. If dirt or debris is on visible on the pinch roller, wipe it off with a lint free cloth dipped in water. If the pinch roller is warped, then replace the pinch roller assembly. Remember to recheck the capstan/pinch roller gap and tape tension after the cleaning or replacement of the pinch roller. Refer to section 5.1.5 for details on replacing the pinch roller assembly.

If all else fails, replace the entire transport assembly. Section 5.1.14 outlines the steps involved in replacing the transport assembly. Note that once the new transport is installed, it will be necessary to recheck brake torque, tension, end sensors, capstan/pinch roller gap, P1 and P4 height, all processor board adjustments and envelope alignment all over again.

Section 5.3 of this service manual summarizes all of the tension related problems detailed in this section. Remember, setting of tape tension is an iterative process and one that become very frustrating if severe tension problems are encountered. If the service technician follows the same methodology for every ADAT serviced, then determination of where the problem lies becomes simple.

4.3.4 Head Alignment

Head alignment is the process in which the information recorded on tape is brought in line with the physical location of the rotating upper drum. There are two considerations to be aware of when performing head alignment: linear head adjustment and envelope maximization. Adjustment of the linear head height (up and down) and azimuth (the angle of the head relative to the horizontal) allows the service technician to set the linear head in the proper position relative to the rotating headstack. Envelope maximization involves the movement of the linear head across the tape surface from side to side until it reaches its optimal location; that point on the tape where the recorded information is read by the rotating upper drum with the greatest efficiency. This procedure requires the use of a special alignment tape.

4.3.4.1 Alignment Tape

The tape used for head alignment of the ADAT is a special calibration tape made for Alesis. This tape contains a very narrow track for precision tuning of the rotary upper drum and linear head. Each tape's width must be precisely defined and found to be within a tightly specified thickness prior to becoming an alignment tape. The information on these tapes is precisely recorded at the factory. Although it is possible to digitally duplicate this tape, the duplicate tape will not function correctly.

Note that when the alignment tape is played inside the ADAT, "Er 7" will flash on the front panel display. This is a normal condition caused by the lack of data and timecode information which is written onto a normal ADAT cassette.

On the cassette itself is a label which contains vital information about the tape characteristics. Please do not remove or deface the information on the cassette label. In addition to the tape's unique serial number and the date the tape was made, there are two voltage levels written on the label which define the proper functionality of the ADAT Read Head System, both mechanical and electrical. These voltages are carefully measured for each individual calibration tape on an Alesis standard reference ADAT. The voltage readings were taken immediately after the development of the alignment tape.

These voltages represent the minimum allowable read head amplitudes for the alignment tape in question. One voltage rating is for the PG high head and the other is the rating is for the PG Low head. For example, if an alignment tape has the numbers 1.0/0.9 written on the tape label, it means that the minimum allowable envelope amplitude for all ADATs aligned with this tape is 1.0 volts p-p for the PG High head and 0.9 volts p-p for the PG Low head.

Theoretically, these voltages should be accurate for the entire life of the tape. However, in reality, the voltage levels may decrease over a period of time due to a number of factors. These include frequent tape use, tape damage such as scarring of the tape edge, user abuse, loss of magnetic tape particles and the like. If it is suspected that the voltage reading of a particular alignment tape is no longer valid, try using a known working alignment tape in the same ADAT and compare the results.

The Alesis alignment tape is supplied to all service centers by Alesis. This tape should be used **ONLY DURING HEAD ALIGNMENT** and should not be used for troubleshooting transport or other problems. When not in use, the tape should be stored in its protective cover.

If you encounter any problems or difficulties with the performance of the Alignment Tape, or when it is time to replace an expired tape, please consult with your service contact at Alesis or the Alesis Customer Service Manager.

You will note that Appendix E details the tape path alignment procedure. First, a "rough" adjustment is performed, then the tape path is set, then a "fine" adjustment is made. A normal, formatted, cassette should be used when performing the "rough" alignment. This will prevent damage to the Alignment Tape in cases where the tape path is way out of adjustment. Use the Alignment Tape only after the tape path has been set correctly.

4.3.4.2 Oscilloscope Setup

A few words about the set up of the oscilloscope are in order. Table 4.1 mentions that an oscilloscope with a "B Delay" function is required to complete the alignment process. The "B Delay" function will allow you to make very fine adjustments of the PG Delay Offset and Envelope Offset which are required to properly align the FG pulses with the physical location of the heads in the rotating drum.

The use of high capacitance probes is recommended. Straight line probes and the like cause the Read Pre-2 circuitry to become overloaded. As a result, distortion of the waveforms occur.

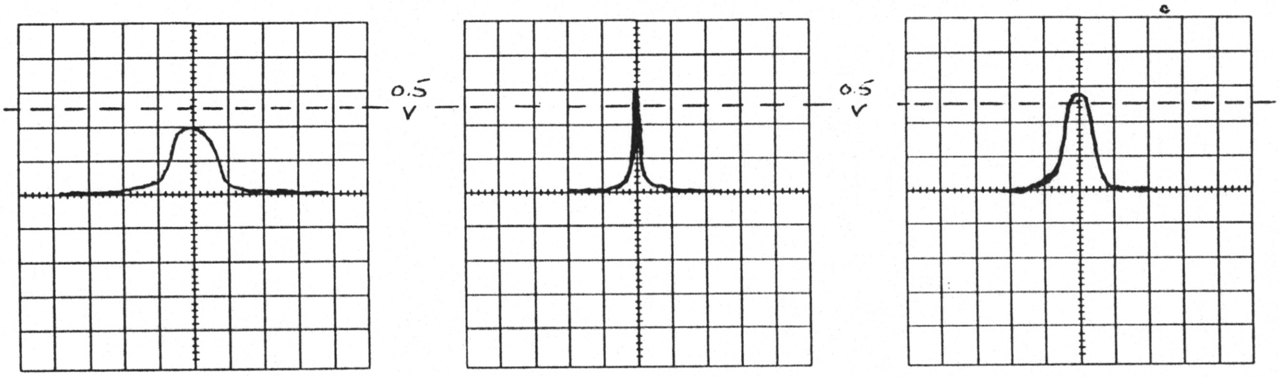
The PG pulse is the signal which the oscilloscope uses as its trigger in all measurements pertaining to the ADAT. Test Point 6 (TP6) of the Processor PCB is the spot where the trigger probe should be connected. When the trigger is viewed on the scope, it will resemble a pulse whose period lasts 20 ms. The first half of the pulse is high and the second half is low. These two halves are referred to in the text as PG high and PG low. On the headstack, one read/write head combination corresponds to PG high and the other read/write head combination corresponds to PG low. The PG high/low combination represents one full rotation of the drum.

4.3.4.3 Linear Head Adjustment

In order to adjust the linear head, it will be necessary to monitor the linear head amplitude with an oscilloscope. The linear head adjustment screw raises or lowers the amplitude of the signal while the azimuth adjustment screw defines the focus of the signal. Refer to Appendix E of this service manual for the steps involved in setting the proper linear head location. The nominal voltage measured at the cathode of D14 should be at least 0.5 volts.

Figure 4-2a shows an improperly adjusted linear head. It can be seen that the azimuth has not been set correctly because the waveform is rounded off at the top. The linear head voltage has also been affected by the improper setting of the azimuth. In this figure, the voltage off of D14 is only 0.4 volts. Figure 4-2b shows the same linear head which has now been properly adjusted. Note that the voltage is now 0.6 volts and the waveform looks like a very narrow spike. In an ideal case, the waveform of fig. 4-2b is what would be seen for every ADAT linear head which is adjusted. However, research has shown that some linear head waveforms do not resolve to the narrow spike and appear similar to fig. 4-2c. This is acceptable because the linear head amplitude is above 0.5 volts and the azimuth has been maximized.

If the linear head amplitude is not at least 0.5 volts, it may be necessary to replace the linear head. Consult section 5.1.7 for details on the replacement of the linear head.



(a) (b) (c)

Figure 4-2 - Linear Head Adjustment

4.3.4.4 Envelope Maximization

Envelope maximization is the process whereby the tape is set to its optimal position as it passes by the rotating drum. Additionally, all of the topics discussed earlier in this section are brought to bear at this point because envelope maximization will disclose any problems related to brake torque, P1 and P4 alignment, tape tension and linear head position. Therefore, it is always best to make this the final step in the tape path alignment procedure.

Envelope maximization involves the setting of the envelope amplitude to its highest level, confirming the presence of a flat envelope across the entire rotation of the drum, checking that the envelope deviation between the two read heads is within specified limits, and setting the PG Delay Offset. Finally, the tape path will be checked for any problems which would restrict the envelope amplitude in any way. If the transport has been set up in the manner described previously in this section, then envelope maximization should be an extremely simple procedure.

The envelope of the ADAT can be viewed by placing a probe on Test Point 1 (TP1) of the Read-Pre 2 PCB. This envelope represents the composite signal of all 8 tracks which are read by each head as it passes over the tape surface. When an envelope is properly aligned, its trace resembles the one shown in Figure 4-3

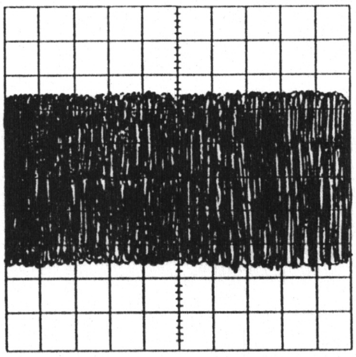


Figure 4-3 - A Properly Aligned Envelope

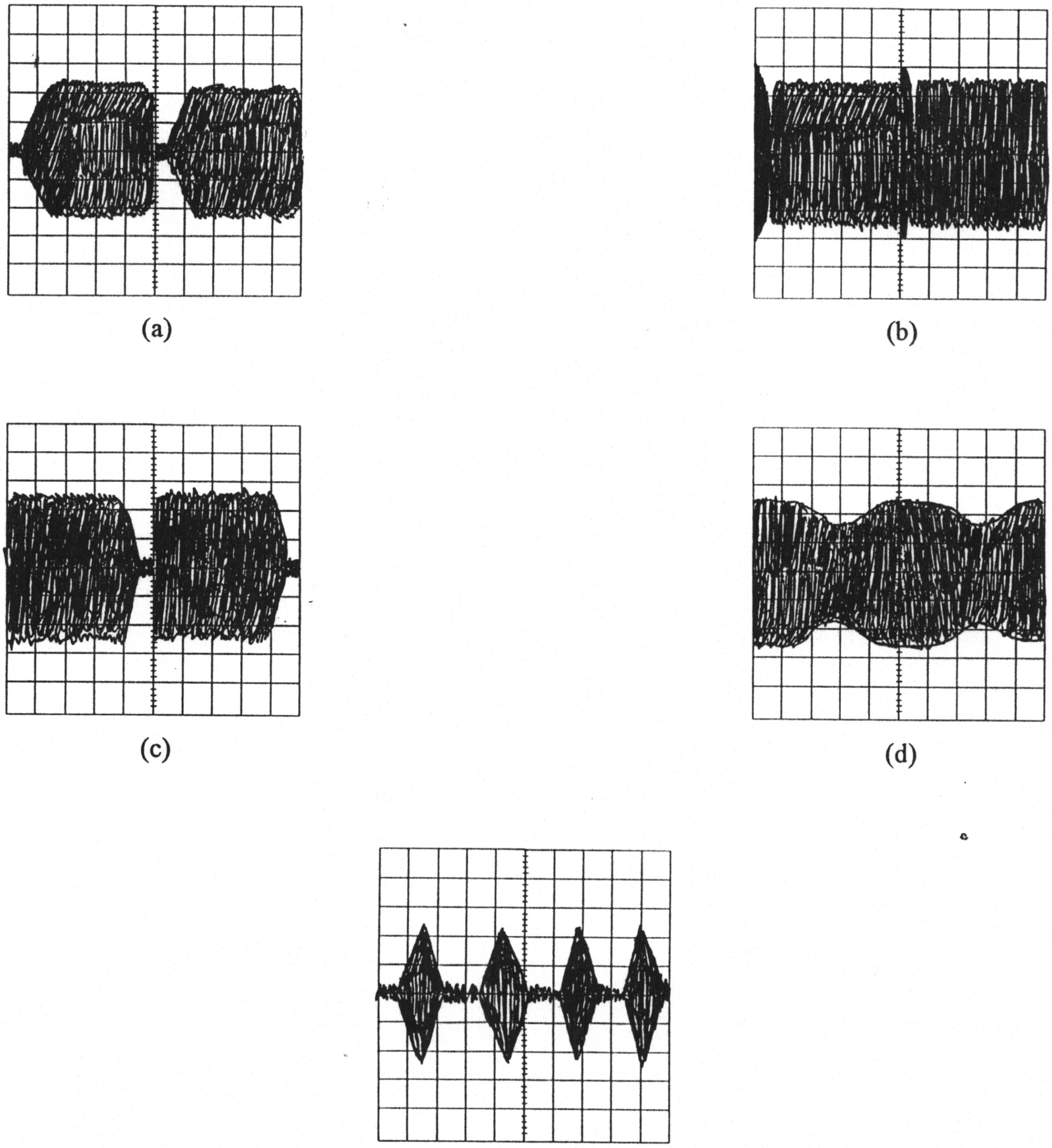
4.3.4.4.1 Envelope Flatness

Proper envelope flatness will minimize tracking errors which may occur in the future. Things such as wear and tear, dirty heads and the like all contribute to tracking errors. However, if the envelope is not flat across the entire PG cycle, problems are sure to occur over extended use of the ADAT in the field. Appendix E outlines the process of checking envelope flatness.

If the envelope is not flat, it is probably because the P2 and/or P3 tape guides are not set to their optimal positions. P2 controls the angle of the tape as it enters the rotary headstack and P3 controls the angle of the tape upon exit from the headstack. When these guides are set correctly, the tape will pass through the rotary headstack at the correct angle and height, making alignment with the heads uniform across the entire width of the tape.

Figures 4-4a and 4-4b show an envelope whose P2 post is not set to its optimal position. When checking for proper P2 alignment, observe the envelope amplitude at the start of the PG high and PG low cycles. In Fig. 4-4a, the post has set the angle of the tape too high against the rotary headstack and therefore the top portion of the tape is not being read properly by the headstack. In Fig 4-4b, the angle of entry is too low, causing the tape to "buckle" against the lower drum helical groove.

Figure 4-4 - Examples of Mis-Aligned Envelopes


(a)

(b)

(c)

(d)

(e)

Likewise, Figures 4-4c and 4-4d show an envelope whose P3 post is not set in its correct position. The envelope amplitude decays at the end of the PG high or PG low cycle if the P3 post angles the tape out of the headstack at a height which is higher than optimal whereas the envelope resembles a "fish" if the P3 angles the tape too low off of the headstack.

For any of these conditions, the P2/P3 alignment tool may be used to set the posts to their correct positions. BE CAREFUL! The posts are extremely sensitive and less than 1/4 turn of the alignment tool is all that is needed to make drastic changes in envelope flatness. If you turn the post too far, it may take a long time to get the original envelope back!

If, however, this condition does occur, you may observe a diamond shaped envelope on the oscilloscope display similar to figure 4-4e. This is a picture of a P2/P3 post that is way out of alignment. The easiest way to get the original envelope back is to perform the following steps.

1. Look at the tape as it travels across the rotary headstack. You will notice that the lower drum contains a helical groove running across its length. Position the bottom of the tape so that it just touches this groove. The P2 and/or P3 posts will assist you in getting the tape to this position.
2. Using your thumb, move the linear head assembly forward until an envelope is observed. Place your index finger against the linear height nut and use you thumb to pivot the head assembly.
3. Hopefully, by this time, you should see an envelope on the oscilloscope display. Use the P2/P3 adjustment tool to properly set the flatness while the envelope is still in view.
4. Release the linear head back to its normal position and continue with envelope maximization.

If you feel that P2/P3 are set to their optimal positions and the envelope still does not look flat on the oscilloscope display, verify that the P2 and P3 assemblies are set to their nominal positions. Refer to figure 4-5 for a pictorial representation of the nominal positions of the P2 and P3 assemblies. In the case of P2, the cut out on the base of the assembly should be in line with the hole in the P2 arm when the tape is engaged. Run the "CAP" self test in order to see this. For the P3 assembly, the left side of the cut out should be tangent to the hole in the P3 arm when the tape is engaged.

Remember that once you set the P2 and P3 assemblies so that the envelope is flat, you must recheck tape tension to verify that it has not been affected by the P2 and P3 alignment.

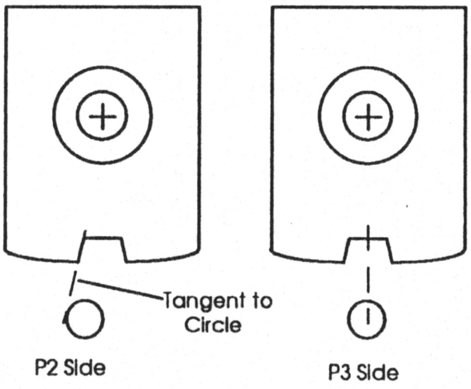


Figure 4-5 - Nominal Positioning of the P2 and P3 Assemblies

4.3.4.4.2 Envelope Deviation

In a normal ADAT, both halves of the envelope, and therefore both read heads, should be of roughly the same amplitude. However, the characteristics of each head in the rotating drum are different and therefore a discrepancy in the amplitude of each read head may exist. Envelope deviation is a test to verify that the amplitude difference between each of the read heads is within specified limits. Appendix E details the steps involved in checking for proper envelope deviation.

The specification states that the difference in amplitude of the two read heads in the ADAT has to be less than 6 dB. This corresponds to a fifty percent reduction in amplitude of one read head to the other. For example, if the envelope amplitude of the PG High read head is 2.0 Volts p-p, the minimum amplitude of the PG Low read head must be at least 1.0 Volts p-p.

If the envelope deviation is close to the 50% limit, technically the unit passes the spec., but may introduce read errors which would be seen as a flashing decimal point on the front panel display. If the envelope deviation is more than 6 dB (50%) between the two heads, then most likely a problem exists with the heads themselves. Very few times is the problem related to the read pre-amp circuitry on the Read Pre 2 PCB. In the above examples, the entire drum assembly would require replacement and alignment rechecked with the new drum assembly. Refer to section 5.1.9 for information on replacing the rotating head assembly. However, if you observe no amplitude at all on one side of the PG pulse, this may indicate a circuit or cable problem.

4.3.4.4.3 PG Delay Offset

PG delay offset is the process of aligning the envelope with the physical location of the read heads on the rotating headstack. This is essentially a fine tuning of the PG delay so that it is in perfect alignment with the read heads. Appendix E describes the method of setting this offset.

Between both halves of the read envelope of the alignment tape there is a small header embedded into the track. This header defines the end of the PG high envelope and the start of the PG Low envelope. It is important to set this header to the point where the PG signal falls from high to low, indicating the transition between the two read heads in the rotary headstack. If this header is not lined up with the falling edge of the PG signal, the envelope for either of the heads may not be optimally read by the headstack.

If you rotate the pot corresponding to the PG delay setting (R147), you can observe the effect that the PG delay offset can have on the envelope. Using the "B delay" function of the oscilloscope, and while viewing the trigger pulse, the service technician is able to correctly set this gap in accordance with the procedures documented in Appendix E. If the envelope resembles that of fig 4-6a or fig 4-6b, then the PG delay offset is not set correctly.

If the envelope still resembles that of fig 4-6a or 4-6b and the PG delay offset has been set correctly, it usually indicates that there is a problem with the tape guides. Sometimes it may indicate that tape tension is not set correctly. Verify that all the adjustments have been set up according to the details described above. If that does not resolve the problem, then perhaps the alignment tape itself requires replacement. Check the unit with a known good alignment tape and compare the results.

4.3.4.4.4 Envelope Amplitude

The final part of the envelope maximization process is correctly setting the envelope amplitude. Appendix E describes the necessary steps required to set the envelope amplitude.

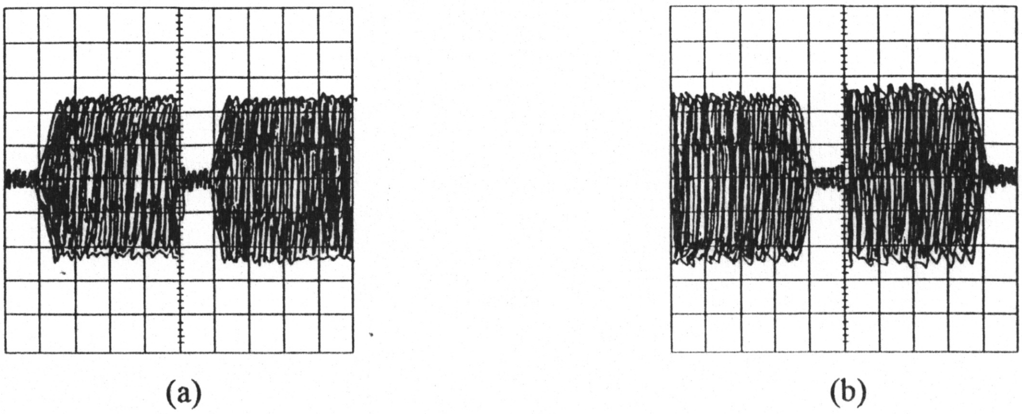

(a) (b)

Figure 4-6 - Improperly Set PG Delay Offset

If no amplitude is observed on the oscilloscope, or the amplitude is low, it may be a problem with the Read-Pre 2 PCB, the cable from the lower drum to the PCB or the read heads themselves. To verify that the cable is working, take an oscilloscope probe and check the connector leading from the lower drum to the Read Pre 2 PCB. There are six wires in the connector that fits into the PCB. The wires are grouped in two sets of three, two for signal and one for ground. If the cable is transmitting signal correctly, then there should exist a "mini envelope" similar to the one observed on TP1. Pin 4 corresponds to PG high envelope and pin 6 corresponds to the PG low envelope.

If the signal exists at this point, then the problem either with the Read Pre 2 PCB itself or somewhere on the Processor PCB. Low amplitude may also be the result of a faulty OP amp on the Read Pre-2 PCB. Try replacing OP amps U2 and U3 on the Read Pre-2 PCB and then readjust the envelope amplitude. If that doesn't help, consult table 5.2 for other suggested solutions.

If no signal is present on the cable, then either the cable or the heads are bad. In both cases, the head assembly should be replaced. Refer to section 5.1.9 for information on replacing the rotating head assembly.

The final check as outlined in Appendix E is the best way of verifying proper alignment. If the envelope behaves strangely at the start of each PG cycle when you perform this check, it is primarily an indication that tape tension is too high, P1 is not set correctly, the impedance roller is warped or the supply hub is warped. Likewise, if the envelope behaves strangely at the end of each PG cycle when you perform the final check, it is primarily an indication that tape tension is too high, P4 is not set correctly or the take up hub is warped. Recheck all these alignments and retest.

Remember that a full, flat envelope should be displayed on the oscilloscope within 2 second after **PLAY** has been pressed. If the envelope amplitude is not flat within the specified time, and all of the adjustments described above are correct, verify that the white roller of the P2 and P3 posts is spinning freely. If either one of these posts is not spinning freely, replace the assembly and recheck the alignment.

You may also hear an audible squeal coming from the transport when the final check is performed. This is attributed to a squeaky P2 or P3 post. It should be easy for the service technician to identify the roller which is causing the squeal by isolating the sound to the faulty part. If a post is squeaky, first determine if a simple adjustment resolves the problem. Otherwise, replace the affected assembly and recheck tension and alignment.

4.4 Cleaning The Tape Path

The reference manual supplied with each ADAT specifies the use of a cleaning tape for the tape path and rotating drum. This is the method which should always be recommended to end users of the ADAT. However, the service centers should clean the ADAT transport in more detail.

Cleaning the tape path of the ADAT is a relatively simple process. However, caution should be exercised when cleaning the rotating drum.The tape guides, P2, P3, impedance roller, linear head and capstan can be cleaned with a cotton swab dipped in alcohol. The lower drum and helical groove can also be cleaned with a cotton swab dipped in alcohol. However, caution should be observed so that the swab does not come in contact with the rotating heads.

The rotating head assembly can be cleaned with a lint free cloth dipped in alcohol. The heads inside the rotating drum are extremely sensitive to any sort of contact. When cleaning, it is best to hold the cloth in one spot and spin the drum by hand. While the drum is spinning, hold the cloth next to the drum so that it lightly touches the drum surface. Do not try to clean the heads while the drum is operating at normal speed. The pinch roller can be cleaned with water or other cleaner. Do not use alcohol as it will make the rubber brittle. Do not clean the pinch roller while it is touching the capstan.

DO NOT USE 71% ISOPROPYL ALCOHOL TO CLEAN THE TAPE PATH. This type of alcohol contains a large amount of water and may eventually damage the parts inside the transport. It is recommended that 91% or better Isopropyl Alcohol be used for cleaning the ADAT tape path. Finally, always verify that the tape path is dry prior to inserting a cassette. If a cassette is inserted while the heads are still wet, the tape may slide off of the drum and become permanently damaged.

4.5 QC Test Procedure

Appendix E contains the test procedure which must be performed on every ADAT serviced in the field. This test allows the service technician to verify that the unit is working to the highest level of quality. The test includes a check of the alignment as well as other functions such as braking, tracking and the like. This test procedure should be conducted only after all repairs on the unit have been completed.

The QC Test Procedure is written in a step by step, comprehensive manner. It should be conducted in the order written. All test equipment hook up and settings are described in the text and a repair sheet is provided for record keeping purposes. Please make copies of the repair sheet and complete a separate sheet for each ADAT serviced.

If there are no severe difficulties with the ADAT, then this test should take the service technician between 15 and 30 minutes to complete. If problems occur with the unit during the conduct of this test, please consult sections 4.3 and section 5 of this service manual for assistance in resolving said problems.

4.6 Self Tests

The ADAT contains several self test routines that can assist the service technician in troubleshooting problems. There is an automatic self test mode and a selective self test mode. However, the automatic self test mode contains only a subset of all the routines currently available. The paragraphs below detail the specific functions for each self test mode and all of the self test information is summarized in table 4-2.

4.6.1 Automatic Self Test Mode

Pressing **RECORD1** and **RECORD8** during power-on will place the ADAT in the Auto Test mode. Each test in the auto test mode will be conducted in succession by the ADAT and the results will be displayed on the front panel. If the current test passes, the ADAT will automatically continue to the next test in the routine. On the other hand, if the current test fails, the display will indicate the failure and the Auto Test mode will be paused. To continue with the remaining tests, the **AUTO PLAY** button should be pressed by the Service Technician. When the test routine is completed, the serial receive is interrupted at the Sync In port and syncing with other ADATs will not be possible until power is cycled on the unit.

Note that if for any reason other than running self tests, the unit is powered up while the sync cable is connected between the Sync In and Sync Out ports of the same ADAT, none of the front panel functions will work. The unit will power up and display "AdAt" only. You must disconnect the sync cable at one end and cycle power to resume normal operation.

A description of the tests performed by the ADAT during the Auto Test mode are listed herein.

1. **EPROM Test** **ADAT Display: "ProG"**
   This test checks for a correct EPROM checksum.
   The ADAT front panel displays "F-ro" whenever the unit fails its ROM self test.
2. **RAM Test** **ADAT Display: "dAtA"**
   This is a test of the RAM integrity. The ADAT writes bit patterns into RAM and compares these values to those which are read back from RAM.
   The ADAT front panel displays "F-ra" whenever the unit fails its RAM self test.
3. **LED Test** **ADAT Display: "LEdS"**
   Each LED is individually tested in a specific sequence. The record enable LEDs are first, followed by the various function buttons, then the transport controls, and finally the front panel display. The meter bridge LEDs are not tested. There is no message that test passes or fails; it is up to the service technician to visually inspect each LED as it is tested.
4. **Serial Interface Test** **ADAT Display: "InOt"**
   A standard sync cable must be connected between the "Sync Out" and "Sync In" ports on the back of the ADAT prior to the conduct of this test.
   This test checks the serial output of the "Sync Out" port and the serial input of the "Sync In" port. This test also checks the 48 KHz clock as well as timecode send and receive functions.
   The ADAT front panel displays "F-io" whenever the unit fails its Sync I/O self test.
5. **Front Panel Switch Test** **ADAT Display: "butn"**
   This test checks the proper operation of all front panel buttons. As each button is pushed, its function is shown on the front panel display. All of the buttons on the front panel will yield a reading on the display. This includes the record ready switches under the meter bridge, all function switches and all transport controls.
   To exit this test at any time, press the **PITCH Δ** and **PITCH ∇** buttons simultaneously.
   The list below shows the appropriate ADAT front panel display for every button on the front panel.

Button	ADAT Display	Button	ADAT Display
Record1	**rc 1**	Eject	**EJCt**
Record2	**rc 2**	Auto Input	**Auto**
Record3	**rc 3**	All Input	**ALin**
Record4	**rc 4**	Format	**For**
Record5	**rc 5**	Digital In	**DiGt**
Record6	**rc 6**	Pitch up	**PiUP**
Record7	**rc 7**	Pitch Down	**Pidn**
Record8	**rc 8**	Locate 1	**Loc1**
Rewind	**rEud**	Set Locate	**SEt**
Fast Fwd	**FFd**	Locate 2	**Loc2**
Stop	**StOP**	Locate 0	**Loc0**
Play	**PLAy**	Auto 2➤1	**A2-1**
Record	**rECd**	Auto Play	**APLy**

6. **Back Panel Switch Test** **ADAT Display: "Lrc"**
This test checks the proper operation of all back panel switch connections (footswitch1, footswitch2, and LRC). As each button is pushed, a number corresponding to its function is shown on the front panel display. The LRC can be used to execute this test. However, the LRC will never display the numbers 1 and 2. To exit this test at any time, press the **AUTO PLAY** button.
The list below defines the number shown on the ADAT front panel display for each function button combination pressed during this test. Note that numbers 11, 12, 13 and 14 are displayed when the two functions listed are pushed at the same time.

ADAT Display	Function	ADAT Display	Function
1	**Foot switch 1**	11	**Play/Stop**
2	**Foot switch 2**	12	**Play/Rewind**
3	**All Input**	13	**Play/Forward**
4	**Auto Input**	14	**Play/Record**
5	**Auto 2➤1**	15	**Play**
6	**Locate 2**	16	**Stop**
7	**Locate 1**	17	**Rewind**
8	**Locate 0**	18	**Fast Forward**
9	**Auto Play**	19	**Record**
10	**Set Locate**		

7. **Digital Interface Test** **ADAT Display: "diG"**
This test checks the digital interface of the ADAT. A fiber optic cable must be installed between the Digital In and Digital Out ports on the back of the ADAT. Additionally, a tape with audio on tracks 1 and 2 is required.
During this test, the audio on track 1 is digitally rerouted to tracks 3, 5 and 7 while the audio on track 2 is digitally rerouted to tracks 4, 6 and 8. Therefore, when the tape is played, the meters should display identical levels for channels 1,3, 5 and 7 and for channels 2, 4, 6, and 8.

Moreover, channels 7 and 8 are delayed by 8191 samples (approximately 170ms). This delay is audible and accesses the DRAM to verify its proper operation.
To exit this test, eject the tape and then press **AUTO PLAY**.

4.6.2 Selective Self Test Mode

Pressing **RECORD1** and **RECORD7** during power-on will place the ADAT in the Selective Test mode. Here, the service technician can scroll through the various tests and choose only those self tests required to check specific ADAT functions. There are four additional self tests in this mode over those in the Auto Test Mode. To view the various tests offered, use the **PITCH Δ** or **PITCH ∇** buttons. Each test will be displayed with a decimal point to the right of the text.

To conduct the test displayed, press the **AUTO PLAY** button. The decimal point will turn off at this time. To exit the current test and return to the main menu, both the **PITCH Δ** and **PITCH ∇** buttons must be pressed simultaneously. The decimal point will turn on at this time. To exit the Selective Test Mode, use the **PITCH Δ** button to scroll to the last test displayed, "donE". Pressing **AUTO PLAY** at this time will exit the test mode and reset the ADAT for normal operation. However, the serial receive is interrupted at the Sync In port and syncing with other ADATs will not be possible until power is cycled on the unit.

Once again note that if for any reason other than running self tests, the unit is powered up while the sync cable is connected between the Sync In and Sync Out ports of the same ADAT, none of the front panel functions will work. The unit will power up and display "AdAt" only. You must disconnect the sync cable at one end and cycle power to resume normal operation.

A description of all the tests performed by the ADAT during the Selective Test mode is listed below.

1. **EPROM Test** **ADAT Display: "ProG"**
   This is the same test as described in section 4.4.1
2. **RAM Test** **ADAT Display: "dAtA"**
   This is the same test as described in section 4.4.1
3. **LED Test** **ADAT Display: "LEdS"**
   This is the same test as described in section 4.4.1
4. **Serial Interface Test** **ADAT Display: "InOt"**
   This is the same test as described in section 4.4.1
5. **Front Panel Switch Test** **ADAT Display: "butn"**
   This is the same test as described in section 4.4.1
6. **Back Panel Switch Test** **ADAT Display: "Lrc"**
   This is the same test as described in section 4.4.1
7. **Digital Interface Test** **ADAT Display: "diG"**
   This is the same test as described in section 4.4.1
8. **Capstan/Pinch Roller Gap Test** **ADAT Display: "CAP"**
   This test is used to set, check or adjust the capstan/pinch roller gap. It can also be used to view the transport while no tape resides in the unit. Prior to beginning this test, verify that no tape is currently in the transport. If a tape is present when this mode is entered, the tape will be automatically ejected.
   Pressing the **PITCH ∇** button will cause the carriage to lower into the transport. Sometimes, the carriage will not lower into the transport because of tape sensing latches at the top of the transport housing (Point D of Fig. 4-1). If

this situation occurs, wait for the carriage to return to its normal position, then physically move these latches up with your fingers while pressing the **PITCH ∇** button. The carriage should now move freely into the correct position.

Press **STOP**, then **PLAY**, then **STOP**.

The capstan/pinch roller gap can be measured at this time. The gap should be between 0.7mm and 1.2mm. It is recommended that the gap be measured two or three times (by pressing **PLAY**, then **STOP**) to get an average reading.

If required, adjust the capstan/pinch roller gap in accordance with the methods described in section 5.1.2.

When the gap is properly set, pressing the **PITCH Δ** and **PITCH ∇** buttons simultaneously will raise the carriage back to its normal position and return the ADAT to the self test main menu.

9. **Tape Load Test** **ADAT Display: "LOAd"**

This test is used to set, check or adjust the cassette present switch. Prior to beginning this test, verify that no tape is currently in the transport. If a tape is present when this mode is entered, the tape will be automatically ejected. During this test, the tape loading mechanism is disabled.

When a cassette is inserted, the LED above the RECORD button on the front panel will illuminate when the cassette present switch is enabled. The point at which this switch is enabled should correspond to the point where the white carriage roller lies above a stamped circle located on the left side of the transport housing (Point E of fig. 4-1).

If required, adjust the cassette present switch in accordance with the methods described in section 5.1.3.

When the load switch is correctly set, pressing the **PITCH Δ** and **PITCH ∇** buttons simultaneously will return the ADAT to the self test main menu.

10. **Track Skip Test** **ADAT Display: "trc"**

This test checks track skipping at various speeds of the ADAT. This is used to verify proper operation of the capstan servo system within the ADAT. A formatted tape is required to run this test.

After a cassette is inserted and **PLAY** is pressed, record enable switches 1 though 6 are used to enable the six different track skip tests. The list below details record switch to track skip test the ADAT performs. During test conduct (i.e. skipping in progress), the PLAY LED flashes. Note that when the ADAT changes pitch (for example, going from test2 to test3), the system waits to stabilize after the pitch change prior to performing the skip test.

Upon completion of each test, the ADAT will display the time in seconds and 1/4 seconds it took to skip the 32 tracks and stabilize. If there was an overshoot or undershoot error, the number of tracks overshot (positive value) or undershot (negative value) will be displayed. In either case, pressing the **PITCH Δ** button will display the time and pressing the **PITCH ∇** button will display the number of tracks over/undershot.

In a normal working unit, the time displayed for each test should be less than 3.00 sec. If a result is displayed indicating an error, repeat the same test three times. If the error still exists, this indicates a possible problem with the capstan servo system. Refer to table 5-2 for a guide to possible solutions to this type of problem.

Pressing the **PITCH Δ** and **PITCH ∇** buttons simultaneously will return the ADAT to the self test main menu.

Switch	Test Performed
RECORD1	Skip +32 tracks at pitch 0
RECORD2	Skip -32 tracks at pitch 0
RECORD3	Skip +32 tracks at pitch +100
RECORD4	Skip -32 tracks at pitch +100
RECORD5	Skip +32 tracks at pitch -300
RECORD6	Skip +32 tracks at pitch -300

11. Sample Skip Test — ADAT Display: "SSt"

This test checks sample skipping at various speeds of the ADAT. This test is used to verify proper operation of the drum servo system within the ADAT. A formatted tape is required to run this test.

After a cassette is inserted and **PLAY** is pressed, record enable switches 1 though 6 are used to enable the six different sample skip tests. The list below details record switch to sample skip test the ADAT performs. During test conduct (i.e. skipping in progress), the PLAY LED flashes. Note that when the ADAT changes pitch (for example, going from test2 to test3), the system waits to stabilize after the pitch change prior to performing the skip test.

Upon completion of each test, the ADAT will display the time in seconds and 1/4 seconds it took to skip the 480 samples and stabilize. If there is any overshoot or undershoot, the number of samples remaining is calculated and sample skipping is automatically retried until 480 samples from the original timecode have been skipped

In a normal working unit, the time displayed for each test should be less than 3.00 sec. If a result is displayed indicating an error, repeat the same test three times. If the error still exists, this indicates a possible problem with the drum servo system. Refer to table 5-2 for a guide to possible solutions to this type of problem.

Pressing the **PITCH Δ** and **PITCH ∇** buttons simultaneously will return the ADAT to the self test main menu.

Switch	Test Performed
RECORD1	Skip +480 tracks at pitch 0
RECORD2	Skip -480 tracks at pitch 0
RECORD3	Skip +480 tracks at pitch +100
RECORD4	Skip -480 tracks at pitch +100
RECORD5	Skip +480 tracks at pitch -300
RECORD6	Skip +480 tracks at pitch -300

12. Exit Test Mode — ADAT Display: "dONE"

Returns the ADAT to its normal mode of operation.

TABLE 4.2 - SELF TEST SUMMARY

Test Name	Test Mode	ADAT Display	Summary Of Test
EPROM Test	Both	ProG	Checks ROM Integrity
RAM Test	Both	dAtA	Checks RAM Integrity
LED Test	Both	LEdS	Checks Front Panel LEDs
Sync I/O Test	Both	InOt	Checks ADAT Sync Interface
Front Panel Button Test	Both	butn	Checks Front Panel Button Functions
Back Panel Button Test	Both	Lrc	Checks LRC & Foot switch Functions
Digital Interface Test	Both	diG	Checks Digital I/O and DRAM
Capstan/Pinch Roller Test	Selective	CAP	Checks Proper Capstan/Pinch Roller Gap
Load Test	Selective	LOAd	Checks Cassette Present Switch Enable
Track Skipping Test	Selective	trc	Checks Functionality of Capstan Servo
Sample Skipping Test	Selective	SSt	Checks Functionality of Drum Servo
Resume Normal Operation	Selective	donE	Exits Self Test Mode

When the last test is completed in either test mode, the unit will reset and normal operation can continue. However, the serial receive is interrupted at the Sync In port and syncing with other ADATs will not be possible until power is cycled on the unit.

Also note that if for any reason other than running self tests, the unit is powered up while the sync cable is connected between the Sync In and Sync Out ports of the same ADAT, none of the front panel functions will work. The unit will power up and display "AdAt" only. You must disconnect the sync cable at one end and cycle power to resume normal operation.

4.7 ADAT Hidden Functions

There are several hidden functions embedded within the ADAT which provide information and shortcuts during normal operation. These hidden functions are listed below:

Keystroke	Hidden Function
SET LOCATE & EJECT	**Master Only Eject** Ejects Tape. If the ADAT is the Master, this function will eject the master's tape and send a MMC stop command to all of the slaves
SET LOCATE & RECORD	**Crossfade Select** Cycles through the four crossfade times used when punching in and out of record: "FAd1" = 10.67ms, "FAd2" = 21.33ms, "FAd3" = 32.00ms, "FAd4" = 42.67ms
SET LOCATE & PLAY	**Device ID** Displays the ID number of the ADAT ("id1" = Master, "id2" thru "id16" = Slave)
SET LOCATE & STOP	**Drum On Time** Temporarily displays the number of hours the Drum Motor has been running since the last ADAT Hard Reset. The range of this counter is from 0000 to 9999 hours. The 32-bit timer value (250ms resolution) that is kept in the battery-backed RAM can count up to 298261 hours (equivalent to 34 years of continuous drum spinning). Upon ADAT Hard Reset, this counter is cleared.
SET LOCATE & FAST FWD	**Software Version** Temporarily displays the current version of software installed in the ADAT.
SET LOCATE & REWIND	**Brake Torque Adjustment Mode** Sets the take up and supply hubs to "soft" brake to allow for brake torque measurements. The ADAT front panel displays "tor" while in this mode. To exit this mode, press **SET LOCATE** and **REWIND** again. This test mode automatically exits after 5 seconds. This mode can only be entered when no tape is in the transport. NOTE: For V2.01 and earlier software, this mode does NOT time out after 5 seconds and must be manually turned off by pressing **SET LOCATE** and **REWIND**. SEVERE DAMAGE TO BRAKES MAY OCCUR IF THE UNIT IS LEFT IN THIS MODE FOR LONG PERIODS OF TIME.
SET LOCATE & AUTO INPUT	**Auto Input Monitor Option Select** Toggles between "In" (input monitor when not playing or recording) and "tAPE" (tape monitor when not playing or recording). Although this option can be toggled independent of the Auto Input status, it is only valid when Auto Input is used. When Auto Input is disabled, record enabled channels are always monitored from the input, regardless of this option setting. Upon Power-On, the option selected prior to Power-Off will be set. Upon ADAT Hard reset, the option defaults to "In"
SET LOCATE & ALL INPUT	**Audio Path Select** Toggles between "In" (input channel audio comes directly from the input connector while non-input channel audio goes through the DAC circuitry) and "dAC" (all audio goes through DAC circuitry). Normal mode is "In". Upon Power-On, the audio path is the normal mode ("In")

ADAT Hidden Functions (Continued)

Keystroke	Hidden Function
SET LOCATE & AUTO 2>1	**Infinite Loop Mode (V3.00 Software or later)** Puts the ADAT into an infinite loop mode between the LOCATE 1 and LOCATE 2 points. The front panel will temporarily display "inF" when this mode is entered. Pressing STOP, FAST FWD, REWIND, or EJECT will automatically revert the ADAT back to its fixed loop limit of 100 loops.
SET LOCATE & AUTOPLAY	**Infinite Loop Display (V3.00 Software or later)** Only valid in infinite loop mode. Displays the number of loops already completed (up to a maximum of 9999 loops).
SET LOCATE & FORMAT	**Tape Format** Toggles between "t160" (T-160 format for T-160 cassettes) and "Std1" (Standard format used with T-60 and T-120 cassettes). The ADAT will determine automatically which standard format is to be used when the tape is loaded. However, the operator must specify the "t160" mode after a T-160 tape has been loaded. The unit will revert back to "Std1" whenever a tape is ejected.
SET LOCATE & DIGITAL IN	**Digital 48 KHz Master Clock** For master ADATs with the **DIGITAL IN** button enabled, this function toggles the internal digital 48 KHz clock on or off. When the clock is enabled ("diG"), the external digital 48 KHz clock will be used if it exists. Otherwise, the internal 48 KHz clock is used. When disabled ("int"), the internal 48 KHz clock is always used, regardless of whether a digital (external) 48 KHz clock exists or not. The master ADAT must disable the 48 KHz clock ("int" mode) when it is receiving digital input from any of its slave units. Power-On reverts the clock to normal ("diG") mode.
SET LOCATE & PITCH Δ	**Instant Pitch Up to Maximum** Immediately changes pitch of ADAT to +200 cents with no ramping. Not allowed while recording. Note that normal pitch up maximum is +100. This is the only way to pitch up to +200. If at any time after this function is executed, the **PITCH Δ** or **PITCH ∇** button is pressed, the ADAT will revert back to its +100 maximum
SET LOCATE & PITCH ∇	**Instant Pitch Down to Maximum** Immediately changes pitch of ADAT to -300 cents with no ramping. Not allowed while recording.
PITCH Δ & PITCH ∇	**Instant Reset of Pitch** Immediately changes pitch of ADAT to 000 with no ramping. Not allowed while recording.
SET LOCATE & RECORD 1	**Record Tab Status** Temporarily displays the record tab status of the currently loaded cassette. "rEcd" = record enabled, "Prot" = record write protected.

ADAT Hidden Functions (Continued)

RECORD 1 & RECORD 8 While POWER-ON	**Auto Self Test Mode** The ADAT enters the Automatic Self Test mode. See section 4.4 for more details on this mode of operation.
RECORD 1 & RECORD 7 While POWER-ON	**Selective Self Test Mode** The ADAT enters the Selective Self Test mode. See section 4.4 for more details on this mode of operation.
RECORD & PLAY While POWER-ON	**User Hard Reset** Initializes memory to a known state without resetting Drum Head time.
RECORD & STOP While POWER-ON	**ADAT Hard Reset** This is the same as the User Hard Reset except that it *does* reset Drum Head time. This function should only be used AFTER replacement of an entire headstack assembly.

5.0 REPAIR AND TROUBLESHOOTING

This section consists of three parts. Section 5.1 is a detailed description of the removal, replacement and adjustment of various parts within the ADAT tranport. Section 5.2 contains a description of the error messages displayed on the ADAT front panel and an explanation of those messages. Finally, section 5.3 is a troubleshooting guide to help the service technician identify problems and the implement solutions

5.1 ADAT Transport Repair

This section explains the steps involved in adjusting or replacing various items within the ADAT transport. Together with the accompanying video, the service technician should be able to service parts within the tranport quickly and easily.

Note that references to the top, bottom, left and right sides of the ADAT are all made while looking at the unit from the front panel.

5.1.1 Adjusting the Tension Band

Adjusting the tension band is accomplished by unscrewing the phillips head screw located to the lower left of the supply hub (point F on Fig. 4-1) and moving the band to the right (decrease tension) or to the left (increase tension) of its current position. Moving the tension band easily can be accomplished by placing a phillips head screwdriver into the hole next to the teeth of the tension band (point G on Fig. 4-1) and turning the screwdriver to move the teeth one way or the other (much like a gear works). Following any adjustments, tighten down the phillips head screw that holds the tension band in place. It is necessary to re-check tape tension every time the tension band is adjusted.

5.1.2 Adjusting The Capstan/Pinch Roller Gap

To adjust the capstan/pinch roller gap, it is necessary to enter the "CAP" self test as described in section 4.6.2. While in the "CAP" mode, all of the transport controls function normally. However, when threading from mode 1 to mode 2, there is no attempt to play the tape before setting in mode 2.

Adjusting the gap is accomplished by unthreading the phillips head screw located on the transport base (Point H of Fig. 4-1) and moving the metal piece to the left (increase gap) or to the right (decrease gap). You may notice a series of interlocking sheet metal pieces which lead from the screw to the pinch roller assembly. Be aware that when the screw is loosened, these pieces may come out of their nominal positions. Place these pieces in their nominal positions prior to re-checking the capstan gap. When the gap is set to its correct position, apply some
Three Bond to the screw to keep it in place.

Whenever the capstan/pinch roller gap is adjusted, it is necessary to re-check tape tension.

5.1.3 Adjusting The Load Switch

To adjust the load switch, it is necessary to enter the "LOAd" self test as described in section 4.6.2. While in the "LOAd" mode, tape loading is disabled.

The load switch is located on the left side of the transport. The switch is mechanically controlled by a plastic black piece (Point J of fig. 4-1) which moves one contact of the switch into position upon insertion of a cassette. The adjustment of this black piece will affect the load switch position and therefore impact the load switch itself.

To adjust this black piece, use a pair of needle nose pliers. Place one end of the pliers on the black piece and the other end on the sheet metal behind it. Squeezing the pliers together will cause the black piece to move towards the sheet metal. This movement will make the switch enable at a later point when a cassette is inserted into the ADAT. Moving the black piece away from the sheet metal will cause the switch to enable at an earlier point when a cassette is inserted. Be advised that if the black piece is moved too far toward the sheet metal, the load switch will not enable at all.

Upon movement of this piece, the Load Test should be performed to verify the correct position of the load switch.

5.1.4 Replacing The Impedance Roller

The impedance roller is the plastic white wheel located between P1 and P2 (Point C of Fig. 4.1). Replacing the wheel is relatively simple.

There is a white plastic "stop" on top of the impedance roller. Loosen this stop with a screwdriver, being careful not to hit the upper drum, then remove it with tweezers or needle nose pliers. There are two black washers which must also be removed. One washer is above the roller and the other is below. These washers must be re-installed when the impedance roller is replaced. Prior to installation of the new roller, lube the impedance roller shaft with a lubricant such as "Lube-It". Remember to replace the white "stop" once the new roller is installed.

Tape tension must be re-checked after replacement of the impedance roller.

5.1.5 Replacing The Pinch Roller Assembly

A series of interlocking sheet metal pieces and a spring connect the pinch roller adjustment screw to the pinch roller assembly. When the screw is loosened, the interlocking pieces can be moved from their nominal positions and the spring can be removed. This will allow for the removal of the pinch roller assembly.

The pinch roller assembly (point K of fig. 4-1) consists a of sheet metal platform and a rubber pinch roller which sits on the platform. The sheet metal platform has a groove cut into the bottom part of the assembly. This groove fits underneath the transport base. In order to free the assembly from the transport base, all of the interlocking pieces have to be moved from their nominal positions, the spring removed and the pinch roller assembly moved all the way to the right. The groove will slide through a small opening in the transport base and be removed easily at this point.

Installation is essentially the reverse process. However, be careful not to bend the grooved portion of the sheet metal platform. If this piece is bent, the pinch roller assembly may come loose within the transport sometime in the future. Remember to re-install the spring.

Both the capstan/pinch roller gap and tape tension must be re-checked following replacement of the pinch roller assembly.

5.1.6 Replacing The P2 And P3 Assemblies

The P2 and P3 assemblies (points L & M of fig. 4-1, respectively) are mirror images of each other. Replacement of these assemblies is as simple as removing the screw which connects the assembly to the transport.

The trick in replacement of these assemblies is that they have to be set to their nominal positions following installation. Refer to figure 4-5 for a pictorial representation of the nominal positions of P2 and P3. Running the "CAP" self test as described in section 4.6 will allow the adjustment of these assemblies while the transport is in the "engaged" mode.

Prior to installation of a new P2 or P3 assembly, verify that the white roller spins freely and that there is some "play" when the roller is moved up and down. After replacement of either the P2 or P3 assembly, tension and alignment must be re-checked.

5.1.7 Replacing The Linear Head Assembly

The linear head assembly (point N of fig. 4-1) consists of the linear head mounted on a sheet metal platform. The entire assembly sits on a shaft and has a spring connected underneath. It is easiest to replace the entire assembly instead of just the linear head.

Remove the nut which fastens the assembly to the shaft. Once removed, pull the assembly upwards a little. You will notice that the spring connects to the sheet metal through a notch under the assembly. This spring must be removed either at the linear head or at the transport base. Once the spring is removed, the linear head slides off of the shaft relatively easliy.

Upon installation of the new linear head, the spring must be re-inserted into its proper position. This spring is very difficult to install because the tension on the spring is very high. It is easiest to insert the spring into the transport base and use pliers to hold the spring into position while connecting it to the linear head assembly. After installation is complete, move the linear head forward with your thumb to verify that it is seated correctly and that the spring is functioning properly.

Linear head height and alignment must be re-checked upon replacement of the linear head assembly.

5.1.8 Replacing The Brake Solenoid (Foreign Service Centers Only)

The brake solenoid sits under the black plastic hubs within the transport. Prior to removing the brake solenoid, these hubs must be removed. For the supply hub (point P of fig. 4-1), the tension band must be removed. For the take up reel hub (point Q of fig. 4-1) the "O" ring must be removed.

For either hub, remove the platic "stop" with tweezers by bending the piece at the break. Remove the plastic hubs and all of the shims and washers.You may notice that some washers are thicker than others. This is a normal condition done so the two plastic hubs are at the same height once installed. Save these shims and washers because they must be re-installed in the exact order in which they were removed.

Turn the ADAT over and de-solder the two wires connected to the solenoid. Remember which wire color is connected to which contact. Unfasten the three screws with a small phillips head screwdriver and remove the solenoid.

It must be noted here that the solenoid has a number on the bottom of its assembly. The number is either stamped directly onto the solenoid or affixed on a sticker. The stamped variety is referred to as an "Old" solenoid while the stickered variety is known as a "New" solenoid. The solenoid used as a replacement must be of the same variety as the other solenoid in the transport. That is to say, both solenoids must be of the same variety, either "New" or "Old". There is no difference between the two part types, but uniformity is stressed for every ADAT.

Upon installation of the solenoid, re-solder the wires onto the contacts. Turn the ADAT over and re-install all shims and washers. It is very important that these shims and washers be re-installed in the exact order in which they were removed. This can not be stressed enough. Uneven hubs can cause big problems with tension and alignment, so be warned!!!

Once the solenoid is replaced and the hub re-installed, snap the plastic "stay" onto the hub, replace the tension band (supply hub) or "O" ring (take up hub). Move the assembly by hand to ensure a smooth spinning action.

The entire alignment procedure must be checked any time a solenoid is replaced.

5.1.9 Replacing The Rotating Head Assembly

The heads, upper drum, Read Pre-1 PCB, write preamp (rotor), lower drum and drum motr PCB make up the rotating headstack. None of these parts are individually replaceable, with the exception of the drum motor PCB (see section 5.1.9.1.) Whenever a problem is found with read errors, write errors, loop test failures and the like, the entire head stack must be replaced. The service technician must exercise caution when removing or installing the rotating headstack. The heads and rotary drum surfaces can be damaged with minute misdirected forces. In most cases, it is difficult to observe the flaw in a damaged head even while under a powerful microscope's inspection. Damage of this type, while not easy to detect, will drastically upset the ADATs performance. Therefore, one must fully understand and respect these circumstances before attempting any deck service of this type.

There are three cables and two wires which must be disconnected prior to removal of the headstack. First, remove the cable connected to the rotor and move it out of the way. Next, remove the cable connected to J1 of the Read-Pre 2 PCB and feed it through the sheet metal. Note that this cable is permanently attached to the headstack and will be removed as part of the headstack assembly. Cut and remove the cable tie at the back of the transport assembly in order to free this cable. Then, de-solder the two heater wires which run from the lower drum to the side panel PCB. Finally, turn the ADAT over and remove the cable connected to the drum motor.

The headstack is now ready for removal. Unfasten the three phillips head screws which mount the headstack into the transport base. They are arranged in a triangular fashion, with one in front and one on either side of the headstack assembly. Remove the headstack carefully by lifting it straight up and then tilting it past the sheet metal stiffener. You may want to remove the stiffener first to reduce the possibilty of scratching the headstack during the removal process.

Upon installation, remember to angle the headstack past the stiffener in order to prevent scratching. Move the headstack along the transport base until it locks into its position. Verify that the linear head cable is not caught in the headstack base. Upon fastening the headstack, you will notice that one of the three screws is smaller in length than the others. This screw goes in the front of the headstack. Attempting to fasten a long screw in the front will not yield the desired stability of the headstack. Re-solder the heater wires to the side panel PCB (remember to put the wires through the black cable tie located at the base of the capstan motor), re-connect the three connectors and insert a cable tie in the back of the transport to strap the lower drum and linear head cables.

You must be aware that two types of drum motors are used in the ADAT. If the new headstack conrtains a different drum motor (either new or old) than the one removed, it will be necessary to perform various hardware mods to the processor board and/or drum motor cable. Refer to Appendix B for details on the modifications.

A full tape path alignment must be performed for the new headstack installed. The loop test described in appendix E must also be conducted.

5.1.9.1 Replacing The Drum Motor

On the underside of the ADAT, as a part of the headstack assembly, is a drum motor PCB. This circuit board is located under a metal housing. By removing the metal housing, the drum motor PCB is accessible.

To remove the drum motor PCB, first remove the cable connected to the PCB. Then, remove the two small phillips head screws which fasten the metal housing to the lower drum. Once the housing is removed, unfasten the three small phillips head screws and remove the PCB.

Installation is the reverse process. The metal housing is magnetized and must be mounted so the magnetization is of the correct orientation. If the housing is not installed correctly, then the envelope displayed on the oscilloscope will contain a large spike at the transition between PG High and PG Low. This is because the read head in contact with the tape surface is 180 degrees out of phase. Achieving the correct orientation is done by lining up the small hole in the housing with the small divot in the lower drum rotor. For new lower drums, the hole must be opposite of the divot.

5.1.10 Replacing The Thread Motor

The thread motor assembly (point R of fig. 4-1) is mounted under the transport base. The assembly consists of a motor, a gear assembly, a belt and a "nitched" piece. The entire assembly should be replaced whenever the thread motor is defective.

To remove the assembly, first remove the spring which connects the "nitched" piece to the tension arm. Then, remove the two wires connected to the thread motor, paying attention to which wire connects to which pole on the motor. Finally, remove the two screws which fasten the assembly to the transport base.

Upon replacement of the assembly, verify that the gear fits properly into place, be sure to connect the two wires to their respective poles on the thread motor and connect the spring onto the furtherest "nitch" to the left of the assembly (when viewed from the top). Tension will suffer if the spring is connected to any other "nitch" on the assembly.

5.1.11 Replacing The Capstan Motor

The capstan motor (point S of fig. 4-1) uses a belt to drive the capstan shaft. This belt must be removed prior to the replacement of the capstan motor.

The motor itself is fastened to the transport base with three screws. One of these screws also fastens a black cable tie. When the screws are removed, the cable tie can either be removed or left in place until the new capstan motor is installed. The capstan motor has two wires connected at the top. When removing these wires, attention should be paid to which wire connects to which pole of the motor. After installation of the motor, re-fasten the black cable tie to the transport base., re-connect the wires to their respective poles, and re-install the belt to the capstan shaft

5.1.12 Replacing The Reel Motor

The reel motor (point T of fig. 4-1) drives the supply and take up hubs for all transport functions. During PLAY, RECORD or FAST FWD, the take up reel is driven. Likewise, for REWIND, the supply hub is driven. Whenever the motor is energized, a clutch is activated which moves a flywheel into the appropriate position. All of the parts mentioned above are interlocked with the motor.

When replacing the reel motor, these interlocking pieces must be disconnected from the motor assembly. There are two screws which fasten the motor to the transport base and a spring which holds the flywheel in place. All of these parts are located on the top side of the transport base, even though the motor is mounted below the base. Remove the spring first, then the two screws. The motor should be free of the tranport base at this time.

Once the motor is free, you will notice it hanging under the transport. The wires which lead to the side panel PCB have been bundled together with other wires and wrapped with a cable tie. You will also notice that the reel motor wires themselves are very small in length. Extention wires have been spliced onto these wires to allow the connection of the motor to the side panel PCB. It is not recommended that you de-solder the wires at the splice point, as it will be necessary to remove and add heat shrink to wire splices once the new motor is installed. Therefore, cut the cable tie and disconnect the wires at the side panel PCB. Note which wire connects to which point on the side panel PCB.

Installation is the reverse process. However, the length limitation of the wires makes the mounting of the motor in only one specific orientation possible. Remember to re-attach the spring to the flywheel and then move the flywheel back and forth in order to verify a smooth movement.

5.1.13 Replacing The Load Motor

The load motor (point U of fig. 4-1) controls the operation of the carriage as it is lowered into the transport housing. It also controls the movement of the carriage upon ejection of a cassette.

In order to replace this motor, first remove the right side panel. You will notice two screws in the front of the motor which fasten it to the transport housing. Remove these screws and pull the motor away from the shaft. You will notice that a small white piece connected to the motor's rotor stays with the motor assembly. This is a normal condition. Next, de-solder the motor's poles from the PCB attached to the motor. The motor should now be free for removal.

Installation of this motor is the reverse process. Remember to make sure that the PCB is mounted onto the motor such that the conector is facing downward. Once installed, re-conduct the "LOAd" self test as described in section 4.6.

5.1.14 Replacing The Transport Assembly

As the ADAT is assembled around the transport housing, replacement of the entire transport assembly is a lengthy procedure. Note that the cassette door is included as part of the transport assembly.

Prior to removal of the transport assembly, it is necessary to remove the top and bottom panels, the two side panels and the back panel. When removing the back panel, remember to disconnect the ribbon cables from the back panel PCBs to the processor PCB and remove the cable from the fiber optic converters to the processor PCB. It is also necessary to disconnect the EMI filter connector from the power supply.

Once these exterior panels are removed, it is necessary to remove the ADA PCB from the transport back panel. There are four screws which hold the ADA PCB in place. Following removal of the ADA PCB, cut the cable tie from the transport back panel and remove the cable from the linear head to the processor PCB. Then disconnect the cable from J1 of the Read-Pre 2 PCB and slide it through the opening to the transport.

Turn the ADAT over and remove the four connectors from the transport. Two connect at the side panel PCB, another connects to the load motor and the fourth connects to the drum motor PCB. Cut all cable ties bundling these cables together and move the cables out of the way of the transport. Now the transport can be un-fastened from the ADAT. There are four screws on the left side of the transport which fasten the transport to the ADAT sheet metal separator. Two are in the front of the transport and the other two are located on the back panel. If all the panels are removed as described above, the transport can be slid out through the back of the unit.

Upon installation of the new transport, first mount the four screws to the sheet metal separator. Then note which type of drum motor has been installed. If it is of the same type as the one removed, then all of the original cables can be re-installed. Turn the ADAT over and re-connect the cables to the transport. Each connector is unique with the exception of the two connectors running to the side panel PCB. Although they are essentially the same connector, the cables are different in length. Connect the "Long" cable to the connector on the top side of the PCB and connect the "Short" cable to the bottom connector. Note that if these two cables are connected to the wrong sockets, the ADAT will most likely display "-du-" upon power up.

If the drum motor is not the same as the one previously installed, a different type of drum motor cable must be installed. Refer to Appendix B for details on which cable corresponds to which drum motor PCB. Once all the appropriate cables are installed, bundle the cables together and use cable ties to strap them down to the transport housing.

Turn the unit back over and connect the lower drum cable to the Read-Pre 2 PCB. Connect the linear head cable and then use a cable tie to strap these cables to the transport back panel. Now, the ADA PCB, back panel (be sure to re-connect the ribbon cables, fiber optic cable and the EMI filter connector), side panels, and bottom panel can be replaced. The ADAT is now ready for alignment and QC test.

5.2 Error Codes

Table 5.1 is a list of all the error codes which are displayed on the ADAT front panel. Along with the error code is an explanation of what the error means. This section also includes an explanation into the reasons for these errors during normal operation of the ADAT as well as recommended solutions.

TABLE 5.1 - ERROR CODE INFORMATION

ERROR CODE	EXPLANATION
-du-	Indicates that the environment is too humid for the ADAT to function properly. When this condition is displayed, tape will not be allowed to thread in the transport.
FULL	Indicates that the serial buffer is full
noFo	Indicates that a tape is unformatted
Prot	Indicates that the cassette's write protect tab has been removed. This message is only displayed when trying to record.
Er 0	When loading a cassette, the ADAT did not see the "tape insert" switch. When ejecting a cassette, The ADAT did not see the "plate down" switch.
Er 1	When attempting to go into the "unthreaded" position, the ADAT did not see the "mode 1" switch.
Er 2	When attempting to go into the "threaded, capstan disengaged" position, the ADAT did not see the "mode 2" switch.
Er 3	When attempting to go into the "threaded, capstan engaged" position, the ADAT did not see the "mode 2" or "mode 3" switches.
Er 4	Indicates that when the tape is threaded, no drum FG toggle was seen within 100ms after the motor was energized (drum is not spinning).
Er 5	Indicates that during play or record, the PG period is not within its valid range (17-25ms). The drum speed is too slow or too fast
Er 6	Not currently used.
Er 7	Indicates that the ADAT is detecting a bad write sector on the cassette when the unit is playing or recording (non-format mode)
Er 8	Indicates that syncronization has been lost while recording. At this point, the tape will stop.

5.2.1 Error Codes Defined into Defects and Solutions

5.2.1.1 Error Code: "-du-"

Besides getting this message because the unit was subjected to overly high humidity, connections leading to and from the dew sensor may be broken or partially separated. Therefore, check the J10 and J11 cables as well as the Lower drum cable and ensure that the ground is well connected to the transport.

5.2.1.2 Error Code: "noFO"

Obviously the tape must be verified to ensure that it is formatted at the place where this message occurs, if the tape is not at the beginning. Note that it is not necessary to format the entire tape in order to record onto it. Otherwise, check for an envelope coming off of the Read Pre 1. (Red and white pairs - J6). Verify that the linear track signal is present on TP4. Also check linear head azimuth and optimize if necessary by viewing U35 - Pin 8 (Processor PCB). It's best to use the alignment\calibration tape for this and adjust the linear head post for maximum amplitude on the vertical parts of the wave form. This error can also be caused by a 'loss' or mis-seated linear head cable or a dirty linear head.

5.2.1.3 Error Code: "FULL"

This error occurs when a slave ADAT is slow to sync to the master ADAT. The serial buffer within the micro controller has become full of data.This could be the result of unlike versions of software within each unit, or a problem with the Sync ASIC or Sync PCB. This condition should only be present for a short amount of time and no reset of the ADAT is required.

5.2.1.4 Error Code: "Er 0"

This may be a problem with either the TAPE LOAD (or insert) switch or the LOAD DONE switch, both located on the left and right outsides of the transport respectively. Verify that these switch contacts are not bent. Additionally, and while no tape resides in the transport, verify that the contacts of the LOAD switch (outer left side of transport) are 'closed' and the contacts of the LOAD DONE switch (outer right side of transport) are 'open'. Finally, check the J10 and J11 cables for proper seating on the Processor PCB and on the transport.

5.2.1.5 Error Code: "Er 1" thru "Er 4"

These error codes usually relate to tape threading. Verify that the tape is seated correctly. Ensure that the capstan/pinch roller gap is set correctly and the capstan is spinning.

Carefully examine all mechanical parts for possible tape inhibiting signs. These include the tension arm, (make sure it is not sticking or moving slowly while the tape is playing), P2 & P3 mounting assemblies (brackets that slide through the base of the transport)., etc.

Verify that the thread motor belt on the bottom side of the transport is installed correctly.

Inspect all cables to ensure that they are seated correctly. Pay special attention to the multi-colored, multi pin 'single in-line' cables coming to and from the transport. You will find that all of these connect to the Processor PCB. In particular, J 7, 9, 10 & 11. Also inspect crimped cable ends closely, ensuring that contact is being maintained.

There are three screws that attach the headstack assembly to the transport; two in the rear and one in the front. The one in the front is shorter than the other two. If these are inserted incorrectly during a headstack replacement, thus a long one being in the front position, the threading mechanism (arms) will be blocked, disallowing the tape from wrapping completely around the drum. In this case, you may see ER2 or ER3 in the display of the ADAT.

5.2.1.6 Error Code: "Er 5"

Check the drum and capstan speeds and make sure that they are stable. Check for anything that may be creating extra resistance in the tape path. For example, something touching the drum, the capstan/pinch roller gap being too tight, high tape tension, a defective capstan motor, belt or flywheel, something underneath the transport, a defective impedance roller, or P2, P3 problems. Verify that P2, P3 and the impedance roller spin freely when there is no tape in the transport. Make sure J7 is connected properly.

This error may also be caused by a weak drum motor. To check this, connect your scope to PG Delay which is found on TP6. Now, with a tape inserted and the drum spinning, slightly touch the Rotor PCB (the round PCB above the drum) to create a slight resistance to the drum speed and then let it go. When you let it go, does PG Delay recover quickly (2-3 seconds average) and not act sluggish? If it seems to act sluggish, and you have already verified that the drum and capstan speeds are stable and within specification, then try replacing the drum motor. Refer to section 5.1.9.1 for details on replacing the drum motor.

5.2.1.7 Error Code: "Er 7"

If this error is seen, it may indicate that the heads are in need of a cleaning. Refer to section 4.4 for details on properly cleaning the heads. However, if this does not resolve the problem, these other solutions may be implemented.

First, check that J3 is connected properly. Next, check to see if there is a signal at TP1 on the Read-Pre 2 PCB. If there is a signal and the ADAT still displays "Er 7", then it may be a read or write VCO problem. The read and write VCO's should be optimized according to the procedure found in Appendix E. If there is no signal at TP1, yet there is signal present at J1 of the Read-Pre 2 PCB, then examine the Read-Pre 2 circuit as well as the cables connected to it. It is possible that the problem occurs after the differential amplifiers on the Read Pre 2 PCB.

If the unit reads existing material okay, but after formatting you encounter "Er 7", then check the write PCB (rotor) for signal at the collectors of Q1 and Q2. This signal should be approximately 12 VDC. If it is not present on either of the collectors, check for signal at the tape ASIC (write data + and - , or pins 59 and 60). If signal does not make it to the collectors, then the rotor itself may be faulty.

5.2.1.8 Error Code: "Er 8"

This error normally occurs when the tape reaches the end while formatting or recording as the unit obviously cannot read timing data from the leader. This error also occurs anytime the unit loses sync. The first thing to check is obvious, the sync cable. If you have already swapped it, make sure that the pins are okay and that it is connected firmly.

To resolve this problem, start with the tape itself. If it has a crinkle in it, and thus some or all of the data cannot be read properly at this point, sync will be lost. Do the obvious: try another tape. At this point you can also swap the sync PCB and associated cable in order to find out if the problem lies there.

Another reason for the occurance of this error may be that the linear head cannot read properly (dirty or mis aligned), or that the cable that connects it to the processor PCB may be bad or partially disconnected at one or both ends. If the drum speed is slower than it should be (you'll probably also get ER5), ER8 may be present. If this is the case, check J7 first to see if it is mis- connected at one end,,or faulty.

5.3 Troubleshooting Guide

Table 5.2 is a troubleshooting guide to assist in the solving of various problems which may occur within the ADAT. This table has been compiled from information gathered at Alesis over the past year. If you find a solution to a problem which is not listed in this guide, please feel free to report your findings to the Alesis Customer Service Manager.

TABLE 5.2 - TROUBLESHOOTING PROBLEMS AND SOLUTIONS

PROBLEM	RECOMMENDED SOLUTION
Er 0 is displayed	1. See Section 5.2.1.4 2. Readjust the TAPE LOAD switch 3. Readjust the LOAD DONE switch 4. Verify that the power supply has all current updates (See Appendix B) 5. Verify that J10 and J11 are connected properly at the Processor PCB
Er 1 is displayed	1. See section 5.2.1.5 2. Verify that all mode switches are functioning correctly (See Section 3.5) 3. Verify that the thread motor is functioning correctly 4. Verify that the thread motor belt is not loose 5. Verify that all gears and metal armatures are not defective 6. Verify that J10 and J11 are connected properly at the Processor PCB
Er 2 is displayed Er 3 is displayed	1. See Section 5.2.1.6 2. Check cables to J7, J9, J10 & J11 of the Processor PCB for opens or shorts 3. Check if Q11 is shorted to J11 on Processor PCB 4. Verify that the Pinch Roller gap is set correctly (See Section 5.1.2 and Appendix E) 5. Verify that all mode switches are functioning correctly (See Section 3.5) 6. Verify that the thread motor is functioning correctly 7. Verify that the thread motor belt is not loose
Er 4 is displayed	1. See Section 5.2.1.6 2. Check Read Pre 2 cable for opens or shorts 3. Check cables to J7, J9, J10 & J11 of the Processor PCB for opens or shorts 4. Check if Q11 is shorted to J11 on Processor PCB 5. Verify that the Pinch Roller gap is set correctly 6. Check for a faulty Drum Motor

Er 5 is displayed	1. See Section 5.2.1.7 2. Verify that the Read Pre 2 cable to Processor PCB is assembled correctly 3. Verify that the tape tension is within spec (See Section 4.3 and Appendix E) 4. Replace Drum Motor (See Section 5.1.9.1)
Er 7 or dAtA is displayed (when not in the "dAtA" portion of the tape)	1. See Section 5.2.1.8 2. Clean heads 3. Verify that the capstan motor is functioning correctly 4. Verify that the filter update to the Read-Pre 2 PCB is installed correctly 5. Verify that L3 is within specified range (See Appendix E) 6. Verify that error rate has been minimized (See Appendix E) 7. Replace Tape ASIC 8. Replace Read-Pre 2 Cable 9. Replace Read-Pre 2 PCB 10. Replace Headstack assembly (See Section 5.1.9) 11. Replace Processor PCB
Er 8 is displayed	1. See Section 5.2.1.9 2. Verify that J4 on the processor board is installed correctly 3. Verify that the cable from the linear head to the Processor PCB is assembled and working correctly 4. Verify that the linear head alignment and azimuth are at their maximized amplitude (See Section 4.3.4.3 and Appendix E) 5. Clean linear head (See Section 4.4) 6. Replace Tape ASIC 7. Replace Sync PCB 8. Replace Headstack assembly (See Section 5.1.9) 9. Replace Processor PCB
-Du- is displayed on Front Panel	1. Verify that the connection to the dew sensor is installed correctly 2. Verify that the cable to J10 on the Processor PCB contains no opens or shorts 3. Verify that J10 is installed correctly

Unit Locks Up	1. Verify that thread motor is working correctly (See Appendix B) 2. Verify that mode switches function correctly (See Section 3.5) 3. Verify that J7 contains no shorts or opens 4. Verify that D5 on the Processor PCB has been installed correctly 5. Verify that U44 on the Read Pre 2 PCB is OK 6. Check the Cap FG voltage 7. Verify that none of the cables connecting to the Processor PCB contain shorts 8. Verify that all connectors and cables on the Processor PCB have been installed correctly 9. Verify that all gears are aligned correctly allowing for the P2 and P3 arms to swing freely 10. Perform a User Hard Reset 11. Replace Micro Controller
Tape does not load correctly in transport	1. Verify that +15 Volts is being supplied to load motor 2. Replace U18 on the Processor PCB 3. Replace Load Motor
Tape does not eject correctly	1. Verify that the cable connecting to J11 on the Processor PCB contains no opens or shorts 2. Verify that J11 on the Processor PCB is installed correctly
Tape is not wound completely into the cassette when tape is ejected	1. Verify that Brake Torque is not too low 2. Verify that the cables connecting to J10 and J11 of the Processor PCB contain no shorts or opens 3. Verify that Q12 or Q13 is not open 4. Verify that Q10 or Q11 is not open
Capstan still spins after tape has been disengaged	1. Check U15 for proper installation
Noise is heard in Fast Forward or Rewind (Disengaged Mode)	1. Verify that the tachometer wheel is not noisy (The "O" ring should be removed to check this) 2. Check for debris on the drive motor rubber wheel 3. Verify that the brake solenoids for each hub are not noisy.
Tape plays too fast	1. Verify that "digital In" is not enabled 2. Verify that Drum FG and Cap FG are set to their proper voltage level (See Appendix E) 3. Replace Micro controller 4. Replace Tape ASIC 5. Replace Reel Motor
Rewind is slow	1. Verify that P2 or P3 white tape guides are spinning freely 2. Replace Reel Motor 3. Replace Processor PCB

Improper time is displayed during rewind or fast forward in disengaged mode	1. Verify that R50 is installed correctly 2. Verify that R49 is installed correctly 3. Verify that R181 is installed correctly 4. For new linear heads, verify that a 24K Ohm resistor has been installed (See Appendix B) 5. Verify that the cable to J10 on the processor board contains no opens or shorts 6. Verify that J10 on the Processor PCB has been installed correctly 7. Replace Tach sensor
Improper time is displayed during fast forward or rewind mode in threaded mode	1. For new linear heads, verify that a 24K ohm resistor has been installed (See Appendix B) 2. Verify that linear head is set at its optimum position (See Appendix E) 3. Replace Linear Head (See Section 5.1.7)
Little or no Brake Torque is seen during Brake Torque Self Test	1. Verify that there are no opens or shorts in brake circuitry on Processor PCB 2. Verify that voltage at J11 pins 8 and 9 on the Processor PCB drops from 15 volts to 10 volts when brake torque self test is initiated. If not, problem is in brake circuit. If so, problem is in brake solenoid. 3. Verify that the proper resistors are installed for R32 and R51 on Processor PCB 4. Verify that the proper software is installed in U5 on the Processor PCB 5. Verify that the cable from J11 on the Processor PCB to the side panel PCB contains no shorts or opens 6. Verify that the brake solenoids are wired properly to the side panel PCB. 7. Verify that brake solenoid shaft is not bent. 8. Replace Brake Solenoid.
Brakes come on when tape is engaged	1. Verify that brake circuit is connected properly at side panel PCB.
Drum won't spin when tape is engaged	1. Verify that Drum Motor cable is installed correctly to Drum Motor (under head assembly) 2. Verify that the cable connecting to J11 of the Processor PCB contains no shorts or opens 3. Verify that J11 on the Processor PCB is installed properly 4. Verify that the Read Pre 2 cable contains no shorts or opens 5. Replace Head Assembly 6. Replace Thread Motor 7. Replace Power Supply 8. If a new drum is installed, replace the cable between the drum motor and the Processor PCB 9. If a new drum is installed, verify that the proper updates to the Processor PCB have been installed (See Appendix B)

Tension is varying too much (out of spec)	1. Verify that spring from tension arm to thread motor is set in the leftmost position on the thread motor 2. Verify that Capstan/pinch roller gap is within spec (See Appendix E) 3. Verify that P1, P2, P3 and P4 are set within spec 4. Verify that P2 and P3 white rollers are spinning freely 5. Replace tension band 6. Replace the transport assembly (See Section 5.1.14)
NoFo is displayed	1. See Section 5.2.1.2 2. Clean Heads 3. Verify that the cable from the linear head to the Processor PCB contains no opens or shorts 4. Verify that J6 on the Processor PCB is installed correctly 5. Verify that the linear head positioning is in line with the tape path 6. Verify that there is a signal from the wires emanating from the Drum Assembly 7. Verify that D10 on the Processor PCB is installed properly
Play Button blinks during playback	1. Verify that the Cap FG voltage is within spec (See Appendix E)
No Cap FG Voltage seen on TP5 of the Processor PCB	1. Verify that Cap FG Pot R149 is soldered properly 2. Verify that Cap FG Pot R149 is not broken
Bad Cap FG Voltage (too much variance)	1. Verify that the Pinch Roller gap is within spec 2. Verify that the tape tension is within spec (See Section 4.3.3 and Appendix E) 3. Verify that the P2 and P3 white rollers are spinning freely 4. Verify that the supply and take up reels are not warped 5. Verify that the pinch roller is free of debris
Bad Drum FG Voltage seen on TP3 of the Processor PCB	1. Verify that Drum FG Pot R148 is soldered properly 2. Verify that Drum FG Pot R148 is not broken 3. For newer drums, verify that all applicable updates to the Processor PCB have been installed correctly 4. Verify that no short exists on J9 of the Processor PCB 5. Verify that the cable connecting to J9 of the Processor PCB contains no shorts or opens 6. Verify that the +12 Volt trace to U39 has been cut on Processor PCB's which have a jumper between Q15 and U39 Pin 4 7. Replace Drum Motor
No signal seen on TP6 of Processor PCB or TP1 of Read Pre 2 PCB	1. Verify that Read Pre 2 cable is assembled correctly 2. Replace Read Pre 2 PCB 3. Replace headstack assembly (See Section 5.1.9)

Low Envelope Amplitude	1. Check U44 Pin 5 for low output 2. Verify that Linear Head has been optimized (See Appendix E) 3. Replace headstack assembly (See Section 5.1.9)
Noise on read envelope	1. Verify that the write cable is assembled correctly 2. Replace headstack assembly (See Section 5.1.9)
PG Delay is out of range	1. Replace R138 with a 3.3K Ohm Resistor 2. Replace head assembly
Read VCO variance is out of specified range	1. Verify that D25 and D26 are a matched pair 2. Replace D25 and D26 with a matched pair
Read Errors are seen on oscilloscope	1. Clean Heads 2. Verify that read cables are assembled correctly 3. Replace Tape ASIC 4. Verify that D10 is installed correctly 5. Replace Read Pre 2 PCB 6. Replace headstack assembly (See Section 5.1.9)
Write (Punch-In) Errors are seen on oscilloscope	1. Verify that write cable is assembled correctly 2. Replace Tape ASIC 3. Replace headstack assembly (See Section 5.1.9)
Unit will not record	1. Verify that write protect tab on cassette has not been removed 2. Verify that write protect mode switch is functioning correctly (U7 pin 9) 3. Verify that D15 on Processor PCB is installed correctly 4. Replace Tape ASIC 5. Verify that Record Button is function correctly (Run "butn" self test described in Appendix E) 6. Replace micro controller 7. Perform Power on reset 8. Replace Processor PCB
Unit has little or no channel input	1. Verify that the ribbon cable from the ADA PCB to the Processor PCB is installed correctly 2. Verify that the ribbon cable from the Input PCB to the ADA PCB is installed properly 3. Verify that the ribbon cable from the ELCO PCB to the Input PCB is installed correctly 4. Replace the DAC on the ADA PCB for the affected channel 5. Replace the ADC on the ADA PCB for the affected channel 6. Replace the Audio ASIC 7. Replace the ELCO PCB 8. Replace the Input PCB 9. Replace the ADA PCB

Unit has low or no output	1. Verify that the ribbon cable from the ADA PCB to the Processor PCB is installed correctly 2. Verify that the ribbon cable from the Input PCB to the ADA PCB is installed properly 3. Verify that the ribbon cable from the ELCO PCB to the Input PCB is installed correctly 4. Replace the DAC on the ADA PCB for the affected channel 5. Replace the ADC on the ADA PCB for the affected channel 6. Replace the Audio ASIC 7. Replace the ELCO PCB 8. Replace the Output PCB 9. Replace the ADA PCB
Unit has distorted output	1. Replace the DAC on the ADA PCB for the affected channel 2. Replace the ADC on the ADA PCB for the affected channel 3. Verify that all pins of U31, U32 and U33 are connected properly 4. Replace the Audio ASIC 5. Replace the ELCO PCB 6. Replace the Output PCB 7. Replace the ADA PCB
No Digital Output	1. Verify that the cable from the Digital I/O PCB to the Processor PCB is assembled correctly 2. Verify that the cable from the Digital I/O PCB to the Processor PCB is installed correctly 3. Verify that the external fiber optic cable is not broken 4. Replace the Audio ASIC 5. Replace the Digital I/O PCB
Unit does not sync to other ADATs Unit will not sync as a slave	1. Verify that the ribbon cable from the Sync PCB to the Processor PCB is connected correctly 2. Verify that C130 has been installed properly 3. Replace the Sync ASIC 4. Replace the ribbon cable from the Sync PCB to the Processor PCB 5. Replace the Micro controller 6. Replace the SRAM IC U4 7. Replace the Sync I/O PCB 8. Replace the Processor PCB
Meter bridge on the front panel has some of its segments constantly lit Meter bridge on the front panel has some of its segments not lighting	1. Replace the VU ASIC 2. For lower LED segments (-60 to -50), verify that the ADA PCB contains a DC Offset resistor R117 whose value is 15K Ohms 3. Replace the front panel
LEDs not lighting on front panel display	1. Verify that LEDs are on center 2. Replace front panel

No front panel display is seen upon power up	1. Check for a "clicking" sound, indicating a short in one of the cables which connects to the Processor PCB. 2. Verify that all cables are properly connected to the Processor PCB 3. Verify that R221 is 15 Ohms or less for all Software versions later that 2.01 4. Replace the EPROM 5. Verify that the drum heater wires are not shorted together on the side panel PCB 6. Verify that metal shavings are not shorting out the tachometer wheel 7. Replace the Power Supply 8. Replace the Micro Controller 9. Perform a Power on reset
Drum spins upon power up	1. Check for a short on the cable to J10 of the Processor PCB 2. Verify that J10 on the Processor PCB contains no shorts or opens 3. Verify that Q20 is installed correctly
Supply Reel Spins upon Power On	1. Verify the proper installation of the brake resistor R51 2. Verify that R51 is not shorted to R52 on the Processor PCB 3. Verify that no traces have been cut or shorted on the solder side of U23 on the Processor PCB
Take Up Reel spins upon Power On	1. Verify the proper installation of the brake resistor R32 2. Verify that no traces have been cut or shorted on the solder side of U23 on the Processor PCB
Take up Reel Brakes come on upon Power On	1. Verify that R51 is installed properly. 2. Verify that R51 is not shorted to ground 3. Verify that Q11 is not shorted to Q10
Supply Reel Brakes come on upon Power On	1. Verify that R32 is installed properly 2. Verify that R32 is not shorted to ground 3. Verify that Q10 is not shorted to Q11
Unit fails its Sync I/O Self Test	1. Perform a User Hard Reset to clear SRAM 2. Replace Sync PCB 3. Replace Sync cable 4. Replace Micro Controller 5. Replace SRAM U4
Error Indicator on ADAT front panel is being displayed but no errors are seen on oscilloscope	1. Verify that SRAMs U31, U32, U33 and U4 do not have bent pins. 2. Replace SRAM U31, U32, U33 or U4
Noise is heard in Fast Forward or Rewind (Engaged Mode)	1. Verify that the tachometer wheel is not noisy (The "O" ring should be removed to check this) 2. Verify that P2 and P3 are not squeaking. 3. Verify that the brake solenoids for each hub are not noisy.

APPENDIX A
ADAT SCHEMATICS

APPENDIX B
ADAT CURRENT UPDATES

POWER SUPPLY UPGRADES

Since the original release of the ADAT in 1992, several modifications to the power supply circuitry have been made in order to make the power supply a more robust and reliable component. After several months of research, the final design of the power supply was solidified. When servicing ADATs in the field, it is important to verify that all of these modifications are installed prior to return of the ADAT to the customer.

Follow the steps below to check for the current mods to the power supply. They are listed in reverse order. If the first item on the list is installed, the chances that all of the other mods are installed is high. If any of the ADATs power supplies do not have all of the modifications listed, it must be replaced. The un-modified power supply should be sent back to Alesis for upgrade.

1. Verify that the bridge rectifier, D101, is the following part: KBP205. This component is enclosed in a flat black case. The old version of this part, KBP206, is recognizable through its shiny black casing.
2. Verify that capacitor C113 is of a ceramic material. This is usually a yellow component. Older versions of this part were constructed from poly styrene and are not as robust as their ceramic counterparts. The poly styrene versions of this part would sometimes blow up under normal operation. The older capacitor is usually blue in color.
3. Verify that all diodes, D107, D108, D109, D110, D111 and D201, are the following part: MR822. This is normally a Motorola part. Other manufacturer's parts have been used but the bottom line is that they all have the number "822" on the part. Anything else requires replacement of the power supply.
4. Verify that R122 is 4.7K ohms 10 KΩ
5. Verify that R107 is 27 ohms 1?Ω
6. Verify that there is no capacitor in location C102. This is usually next to C101 but with newer supplies, this location no longer exists on the PCB.

INSTALLING THE "CAP" MOD

The original design of the capstan servo circuitry included a 12 volt feed to U39 on the Processor PCB. However, it was noticed that when the ADAT was pitched up to maximum (+100), there would not be enough voltage in the capstan servo circuit to accomplish the task and thus the ADAT would not sync properly.

The "Cap" mod is installed to supply 15 volts to U39 to enable syncing at faster speeds within the ADAT. The mod consists of a cut and a jumper to the processor PCB. All ADATs serviced must have this mod completed prior to delivery back to the customer. Follow the steps below to install this modification.

1. Verify that power is OFF
2. Cut the trace going to U39 pin 4 on the Processor PCB. Be careful not to cut any of the other traces which are nearby. It is suggested that the cut be made above R125 and below R125 so that a piece of the trace can be removed. This will guarantee that 12 volts is no longer supplied to U39.
3. Install a 24 or 26 AWG jumper from the center pin (collector) of Q15 to U39 pin 4. This jumper will supply 15 volts to U39.
4. Using an Ohm meter, verify that an open exists between the +12 volt leg of the power supply connector J1 and U39, pin 4.
5. Using an Ohm meter, verify that a short exists between the +15 volt leg of the power supply connector J1 and U39, pin 4.

INSTALLING THE "VCO" MOD

In order to increase stability in the VCO circuitry, and to resolve problems associated with the Digital I/O, a modification to the VCO section of the Processor PCB is required.

To check if the mod is installed in the ADAT under repair, measure or visually inspect R153 on the Processor PCB. If its value is 3.3K ohms, then the mod is required. If R153 measures 2.7K ohms, then the mod has been previously installed. Follow the steps below to modify the VCO portion of the Processor PCB.

1. Verify that power is OFF
2. Remove capacitors C133, C134, C135 and C136 from the Processor PCB.
3. Remove resistor R153 from the Processor PCB.
4. Remove inductor L1 from the Processor PCB.
5. Install new capacitors to the locations occupied by C133, C134, C135 and C136. The value of the new capacitor is 15pF.
6. Install a 0.82µH inductor in the location occupied by L1.
7. Install a 2.7K ohm resistor in the location occupied by R153.
8. Conduct the QC Test Procedure to verify the correct installation of all components.

PROCESSOR PCB MODS DUE TO NEW LOWER DRUM

There are two types of lower drum currently installed in the ADAT. If you look at the underside of the ADAT, the type of lower drum can be determined. The "Old" lower drum contains a brass colored metal cover whereas the "New" lower drum has a gray colored metal cover.

If an ADAT headstack assembly is replaced, it is suggested that you install a like lower drum into the unit. If a headstack with an "Old" lower drum is removed, a replacement headstack with an "Old" lower drum is preferred. However, if this is not possible, install the "New" lower drum and perform the modifications listed below.

1. If a "New" lower drum is installed, the drum cable must be replaced. The appropriate drum cable for the "New" lower drum contains a PCB covered in heat shrink. The purpose of this PCB is to convert the signal off of the "New" lower drum to one which is recognizable by the Processor PCB.
2. On the Processor PCB, remove R60 and replace it with a short (a piece of buss wire).
3. On the Processor PCB, change the value of R215 from 470K ohms to 150K ohms by adding a 220K ohm resistor in parallel with R215 or replacing R215 with a 150K ohm resistor.
4. On the Processor PCB, change the value of R104 from 100 ohms to 80 ohms by adding a 390 ohm resistor in parallel with R104 or replacing R104 with an 80 ohm resistor.

If a headstack containing a "New" lower drum is replaced with a headstack containing an "Old" lower drum, only the drum cable requires replacement. The modified Processor PCB will work with the "Old" lower drum. In this case, the drum cable with the PCB would be replaced with a drum cable containing no PCB assembly.

LINEAR HEAD MODIFICATION

There are two types of linear head currently installed in the ADAT. To determine which type of linear head is installed, look at the linear head itself. The "Old" linear head contains a series of letters and numbers on the right hand side of the head which start with the letters "VM". The "New" linear head contains a series of letters and numbers beginning with the letter "J".

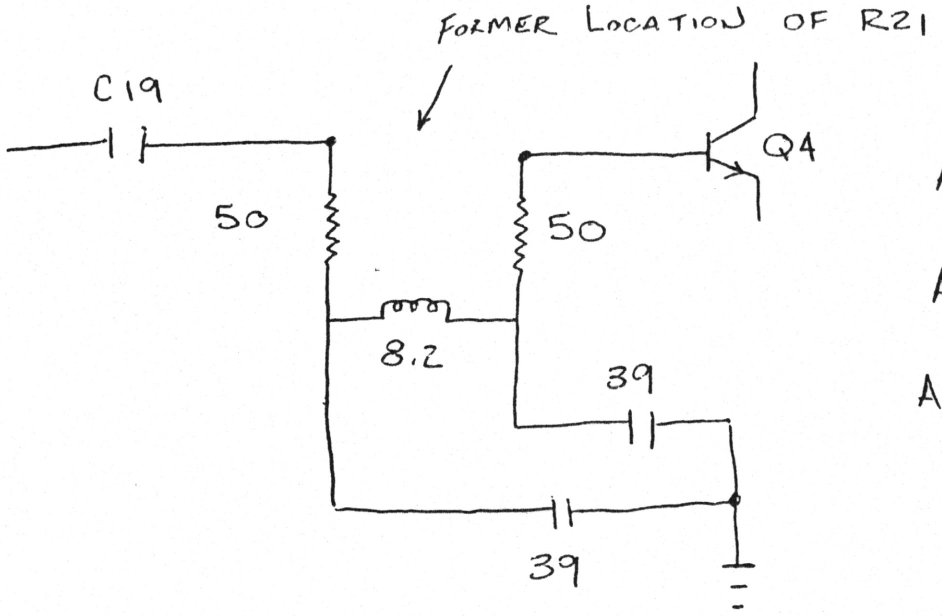
For all new linear heads installed in the ADAT, a 24K ohm resistor must be installed across the two active pins of the linear head assembly. The linear head mod is required to avoid the misreading of the linear pulse in fast forward and rewind mode. If this mod is not installed, the time displayed on the front panel will not correspond to the correct time printed on the tape.

FILTER MOD TO READ-PRE 2 PCB

In order to reduce crosstalk within the ADAT, several modifications to the Read Pre-2 PCB have been implemented. It is suggested that for every ADAT serviced, this modification be installed. Note that the modification described below is applicable only to the Rev D and earlier PCBs. If you receive a PCB with Rev E, the modification described below is not required.

The mod consists of an RLC filter which has been added to the PCB. The filter must first be built and then soldered to the PCB.

Remove the 1K ohm resistor R21 from the Read-Pre 2 PCB
In the location vacated by R21, install the new RLC circuit. See the drawing below for more details



ALL RESISTORS
ARE IN OHMS

ALL CAPACITORS
IN PICO FARADS

ALL INDUCTORS
IN MICROHENRIES

ADAT SOFTWARE UPGRADE TO V3.01

A description of the steps involved in upgrading an ADAT to V3.01 software is listed herein. Before attempting this upgrade, first verify the current version of software installed in the ADAT under repair. This is accomplished by applying power to the ADAT, waiting 5 seconds, and then pressing **"SET LOCATE"** and **"FAST FWD"** simultaneously. The software version should be temporarily displayed on the front panel. Once the current version of software is known, follow the corresponding procedure to upgrade the ADAT.

A. ADATs with V3.00 Software

1. Verify that the unit is "OFF"
2. Remove the top cover of the ADAT by un-screwing the 13 phillips head screws which hold this panel in place.
3. When the cover is removed, look at the Processor PCB and find U5. This is the IC with a label affixed to it. This label should read "ADAT 3.00" along with other text. This is the EPROM which is to be replaced.
4. Using an IC removal tool, remove this IC from its socket on the Processor PCB. **DO NOT USE A SCREWDRIVER TO REMOVE THIS COMPONENT. SEVERE DAMAGE TO THE UNIT MAY RESULT.**
5. Install the new EPROM, V3.01, into the ADAT.
6. Continue with any other testing or troubleshooting.

B. ADATs with V2.01 or V2.02 Software

1. Verify that the unit is "OFF"
2. Remove the top cover of the ADAT by un-screwing the 13 phillips head screws which hold this panel in place.
3. When the cover is removed, look at the Processor PCB and find U5. This is the IC with a label affixed to it. This label should read "ADAT 2.02" along with other text. This is the EPROM which is to be replaced.
4. Using an IC removal tool, remove this IC from its socket on the Processor PCB. **DO NOT USE A SCREWDRIVER TO REMOVE THIS COMPONENT. SEVERE DAMAGE TO THE UNIT MAY RESULT.**
5. Install the new EPROM, V3.01, into the ADAT.
6. Look for brake resistors R32 and R51 on the Processor PCB. Refer to the attached drawing for the location of these resistors on the Processor PCB.
7. De-solder these two resistors, remove them from the PCB and clean out the holes with solder wick or equivalent. Be careful not to pull up the pads which encircle the holes of these resistors.
8. Insert a 220 ohm resistor in each location formerly occupied by the removed components. You will need to cut the leads of the new resistors such that when installed, they mount flush with the PCB. Verify that the resistor leads do not touch the surface of the ADAT below the PCB.
9. Solder the resistors in place.
10. Continue with any other testing or troubleshooting.

C. ADATs with V1.03 or earlier Software

1. Verify that the unit is "OFF"
2. Remove the top cover of the ADAT by un-screwing the 13 phillips head screws which hold this panel in place.
3. When the cover is removed, look at the Processor PCB and find U5. This is the IC with a label affixed to it. This label should read "ADAT 1.03" along with other text. This is the EPROM which is to be replaced.
4. Using an IC removal tool, remove this IC from its socket on the Processor PCB. **DO NOT USE A SCREWDRIVER TO REMOVE THIS COMPONENT. SEVERE DAMAGE TO THE UNIT MAY RESULT.**
5. Install the new EPROM, V3.01, into the ADAT.
6. Right next to the SRAM U4 there are two surface mount resistors. The lower of the two is a 1 Meg Ohm resistor. It will read "105" on the component itself. Remove this resistor and replace it with a surface mount resistor whose value is 150 ohms or less.
7. Look for brake resistors R32 and R51 on the Processor PCB. Refer to the attached drawing for the location of these resistors on the Processor PCB.
8. De-solder these two resistors, remove them from the PCB and clean out the holes with solder wick or equivalent. Be careful not to pull up the pads which encircle the holes of these resistors.
9. Insert a 220 ohm resistor in each location formerly occupied by the removed components. You will need to cut the leads of the new resistors such that when installed, they mount flush with the PCB. Verify that the resistor leads do not touch the surface of the ADAT below the PCB.
10. Solder the resistors in place.
11. Continue with any other testing or troubleshooting.

APPENDIX C
ADAT SOFTWARE HISTORY

ALESIS ADAT
SOFTWARE VERSION HISTORY

DATE	VERSION	COMMENTS
02/28/92	1.00	First production release
03/06/92	1.00A	**Fixes:** 1) Tape Counter: The following sequence would sometimes cause funky tape counter inconsistencies: Fast forward (unthreaded) to end-of-tape, thread tape, rewind (tape counter jump), stop (tape counter jump). The problem was that good timecode was not always being read when threading the tape at the end, so when needed to approximate location when doing the threaded rewind (using last good timecode and linear pulses), the value would be wrong. Now make sure that good timecode is read whenever stop in mode2 (threaded state), and rewind tape more before threading, if at end-of-tape. 2) Locating: Locate 0 would sometimes locate to a point other than 00:00 (e.g. 00:04). This problem was caused by setting the locate0 point to some value (so in relative mode), ejecting the tape, re-inserting the tape and then doing the locate 0 function. This problem is fixed. 3) Fast Rewind: Sometimes fast (unthreaded) rewind speed would slow down prematurely (i.e. before nearing the start-of-tape, where it should slow down). Used to use the tac pulse frequency to determine when to slow down. Now use timecode to determine when to slow down. Note that unformatted tapes will just rewind slower than formatted tapes, so that the tape doesn't rip off when it reaches the start-of-tape. **Changes/additions:** 1) Tape Loading: Some transports would load (grab) the tape *immediately* after the tape was inserted. This was caused by the fact that the loading plate was not ejected far enough. The software now waits 300ms after sensing that the cassette present switch is open before turning off the eject motor. 2) Ejecting: If the transport plate is down, must see that the TapeIn switch is open for at least 1 second before acknowledging an error condition and turning on the eject motor. 3) SelectTimecode field is now updated every time the tape counter is updated. (For MMC purposes)
03/17/92	1.00B	Remove the delay described in item 1) above. Sometimes overshoot causes some motors to get stuck, thus making loading difficult or impossible (sometimes resulting in Er0).
03/25/92	1.01	Checksum (int = B260H, ext = B174H) **Fixes:** 1) Loc0: Slave would reset loc0 point to start-of-tape when powered up. This has been fixed.

2) Loc2:
   a) With both Auto2->1 and AutoPlay enabled, locating to loc2 would cause the unit to play (as it should), but then it would sometimes perform the auto2->1 function and return to loc1. This was caused by the fact that the auto2->1 timecode window is larger than the locate timecode window. Now the tape must be playing for at least a second before checking auto2->1.
   b) With Auto2->1 enabled, holding the pitch up or pitch down button while playing through loc2, would cause the unit to ignore loc2 (i.e. would not return to loc1 when it reached loc2). This has been fixed.

3) Fast Rewind: Unformatted tapes were not being rewound at a slower speed (as described in item 5 above), so that undue tension was created when reaching the start-of-tape. This has been fixed.

Changes/additions:

1) Tape Loading: Must see the tape present for approximately 100ms before loading it. This should prevent premature loading.

2) Hidden features:
   a) Set/All Input - (previous function of Set/Auto Input) toggles between monitoring from input or from dac

   b) Set/Auto Input - adds auto input monitor option.
   The monitoring schemes are as follows:

Auto Input	Option	Action
Off	In	Always monitor from input
Off	Tape	" " "
On	In	Play(tape), Rec(input), else input
On	Tape	Play(tape), Rec(input), else tape

3) Change locate point communication (set locate and locate) from MMC to Alesis sysex.

4) MMC and Alesis System Exclusive communication expanded
   (untested - not currently used).

04/03/92 1.02 Checksum (int = 2D22H, ext = 2B73H)

Fixes:

1) Setting a locate point while locating to that point with deferred play (Play LED flashing) would stop the tape, as it should. However, the deferred play wasn't being canceled and the Play LED would continue to flash. This has been fixed.

2) Digital In:
   a) If enabled Digital In while Play LED flashing (i.e. playing, but not yet in sync), would sometimes hear audio skip tracking. This has been fixed.

   b) When enabled Digital In on Master (using internal clock) while playing, master would not recognize digital input. This has been fixed. Please note the following:
   - Slave: Enable/disable Digital In anytime
   - Master (internal clock): Enable/disable Digital In anytime
   - Master (digital clock): Enable Digital In only when not playing or recording. Disable Digital In anytime.

3) When initiating punch-in from a master unit with a write-protected tape, the record command was not being sent out to slaves in software version 1.01. The record command now is sent out regardless of master tapewrite-protect status.

Changes/additions:

1) Power-on hard reset: There are now two types of power-on resets, user hard reset and real hard reset.

- User hard reset is performed by holding the RECORD and PLAY switches when powering on the ADAT. This initializes memory to a known state, while not resetting the drum head time.
- "Real" hard reset is performed by holding the RECORD and STOP switches when powering on the ADAT. This is the same as a user hard reset, except that this *does* reset the drum head time.

2) More MMC and Alesis System Exclusive communication (untested - not currently used).

04/17/92 1.03 Checksum (int = BAA1H, ext = B9FEH)

Fixes:

1) An interpolation error would occur at locate point2 (punch-out point) when auto looping with 3 or more channels in record. This was caused by the fact that the stop flag was being set before punching out when performing auto2->1. This has been fixed.

2) When starting from an unthreaded position within 3 seconds of locate point, locate would fail. This has been fixed.

Changes/additions:

1) Programmable drum time feature: For the situation in which SRAM must be replaced, it is now possible to program drum time. This is achieved by hold the SET and STOP buttons (the same combination used to display drum time) while powering up a unit. This will put the unit into a special mode with the display showing the current drum time (this is random with an un-initialized SRAM). The following buttons are used to input the new time (#of hours):

Record1 thru Record8 = 1 thru 8
Rewind = 9
Fast Forward = 0

When the desired time is displayed, pressing the STOP button will store this new time. To exit this mode (and restart the machine), press PLAY. (Note: Pressing PLAY does not store the new time)

2) Locating:

a) Locate point compensation changed to accommodate locating problems associated with locate points towards start of tape (e.g. 00:00).

b) Use tape location estimate when close to locate point if cannot read good timecode from tape (this is a safeguard in the instance(s) where we cannot read good timecode; we should really be able to read good timecode for locate accuracy).

3) More MMC and Alesis System Exclusive communication
(not fully tested)

05/07/92 1.04 Checksum (int = 862DH, ext = 84E2H)

Changes/additions:

1) 27512 EPROM required

2) MMC and Alesis System Exclusive communication
(see ADAT Communication Documentation)

06/01/92 1.05 Checksum (int = 1CFCH, ext = 1C16H)

Fixes:

1) Holding record switch while locating would cause locate point to be missed. This has been fixed.

Changes/additions:

1) Format Extend: No changes to the user interface. Changes were made as to how format extending is done internally in order to make it possible to properly format extend a machine whose pitch value is not equal to zero. In previous software versions, format extending a machine whose pitch value was not zero could result in an interpolation error at the location where format extend was initiated.

2) Er5: Some slave units were displaying Er5 (drum speed out-of-range) when trying to play in sync the first time after power-up. Some drums take longer to stabilize than others after sample skipping. Put in 1/2 second delay after sample skipping before checking for Er5 condition.

3) Test Routines:
- AutoPlay switch used to continue on to next test (was PLAY)
- LED test sped up
- Sync cable loop (SyncIn <--> SyncOut) okay when exit
- Button test extended to include footswitch jacks and LRC
- Separate back panel (LRC and footswitches) test added
- Digital Interface test added

(see updated test routine document for further information)

4) New hidden function: Special mode added for setting brake torque. With no tape in the transport, press REWIND while holding the SET switch. The take-up and supply brakes are set so that torque adjustments can be made and the display will show "tor". To exit this mode, press REWIND while holding the SET switch. (Note: This mode cannot be entered if there is a tape in the machine)

5) Cassette loading: Previously, direction and motor bits were simultaneously put low after seeing the plate down switch. However, the plate would continue in the downward direction (even though the motor was disabled), sometimes driving the plate too far and causing undue tension. The transport plate is now stopped more quickly by first putting both direction bits low, then allowing 30ms to pass (time for motor to stop) before disabling the motor.

6) ADAT Sysex Communication:
a) Add command to disable polling command output
b) Change delay time data to 13-bit sample count
c) Change tape offset data to sign-magnitude format

06/03/92 1.06 Checksum (int = 2AFBH, ext = 2A22H)

Changes/additions:

1) Stop eject motor more quickly by first putting both direction bits low before disabling the motor.

06/19/92 1.07 Checksum (int = 8F92H, ext = 8EB5H)

Fixes:

1) Auto-looping: Limit of 100 auto loops was not put on masters that had slave units. This has been fixed.

2) Sometimes when ejecting a tape from rewinding or fast forwarding, the transport LEDs would flash (stack overflow). This has been fixed.

Changes/additions:

1) Test routines:

- It is now possible to individually select and repeatedly perform the test routines. Hold record channels 1 and 7 on power-up to access this test mode. Use the pitch up and pitch down buttons to scroll through the test names. Use the auto play button to enter or execute the currently displayed test. Pressing both pitch buttons will exit the current test and allow selection of another test. To exit the test routines and reset the machine, execute the last test ("donE").
- New test routines: Two new test modes have been added to the selectable test routine menu, but are not incorporated into the auto test. They are the capstan-pinch roller adjustment mode ("CAP ") and load switch status mode ("LOAd").

(See the ADAT test routine document for further information)

2) Hidden features: Holding Set Locate and pressing record channel 1 will temporarily display the status of the record tab on the tape cassette --> "rEcd" for record enabled and "Prot" for record write protected.

3) Thread motor braking: The way in which the tape threading motor is stopped has been changed to be consistent with the way that the load/eject motor is stopped, i.e. putting both direction bits low before disabling the motor.

4) Locate: Noticed that on production units, rewinding to locate point would overshoot by approximately 4 seconds. The tape locate compensation amount was changed to lessen this gap. (locate faster)

5) It is now possible to enter scan mode on an unformatted tape. When initiate a review on an unformatted part of tape, the tape will rewind until it reaches the formatted section where it will go into scan mode. When initiate a cue on a formatted section of tape, the tape scan until it reaches the unformatted section where it will go into regular forward mode.

6) Some tapes on some machines would "noFO" when attempting to scan at the beginning and end of tape. This has been fixed.

7) Make sure the master always sends a Record Exit (and not Record Strobe) command when it punches out. This insures that a master will not accidentally punch-in a slave (a destructive thing). Note, however, that a master that is punching-in *may* punch-out a slave, depending upon the current status of the slave.

6/23/92 2.01 Checksum (int = 8F56H, ext = 8E3DH)

Changes/additions:

1) Version # changed (for production)

7/20/92 2.02 Checksum (int= 4BEDH, ext = 4B27H)

Fixes:

1) Rewinding an unformatted tape would temporarily display timecode a few seconds after pressing the Rewind switch. This has been fixed.

2) Pressing the Stop or Rewind button while in the leader section would erroneously display "data", although still in the Leader section. This has been fixed.

3) Holding PitchUp and PitchDn (to reset pitch) when at -300 cents would reset the pitch, but then would auto-decrement although both switches held. This has been fixed.

Changes/additions:

1) Pressing PitchUp while holding SetLocate now does an immediate pitch change to +200 cents (instead of +100 cents). While at +200, the following will occur:
Pressing PitchUp will cause the ADAT to ramp to 100
Pressing PitchDn will cause the ADAT to ramp to 100,99,98...

2) Drum head time programming feature has been eliminated.

3) Torque mode: A 5 second timeout has been added to the torque mode (SetLoc/Rewind), to prevent the brakes from burning up.

4) Locate points 1 and 2 may now be set while formatting.

5) Test routines:

- Track skip test: This test was added to the selectable test routine options ("trc") to test track skipping. (See the ADAT test routine document for further information)
- Sample skip test: This test was added to the selected test routine options ("SSt") to test sample skipping. (See the ADAT test routine document for further information)
- Serial port (sync) test: The existing serial port test was expanded to include testing of the 48K clock and timecode.

6) Variable tape length: This version of software now supports the following tapes:

Tape Size	Approx. recording time
T-60	19 minutes
T-90	29 minutes
T-120	40 minutes
T-160	54 minutes
E-90	20 minutes
E-120	27 minutes
E-180	42 minutes

- The standard T-120 cassette (as well as the T-90, E-120, and E-180) has a smaller hub than the T-60 (and E-90) tapes. Since the tac equation used to estimate the current tape location when the tape is unwrapped uses hub size information, these two types of tape cassettes require different tac equations. The type of cassette (small or large hub) is automatically determined when a tape is loaded and the appropriate tac equation is used.

- T-160 tapes are not automatically detected. They have the small hub (like the T-120), but the tape thickness is less than the standard and they require yet another tac equation. If using a T-160 tape, press the Format button while holding SetLoc. The display will temporarily display "T160" to indicate it is using the T160 tac equations. (See the hidden features documentation for further information).

12/07/92 3.00 Checksum (int = 5A1FH, ext = 589AH)

This software coincides with a hardware change to the soft brake. Do ***not*** use this software in ADATs without the correct hardware.

Fixes:

1) When punching-out a slave from a master unit, the interpolation light on the slave would flash, although no error on playback. This has been fixed.

2) Button response improved (allow response during threading, unthreading, rew and fwd speed ramping, etc.)

3) When an ADAT slave is in the "LEAd" section, it no longer waits for a steady delta before trying to synchronize to its master.

4) Allow speed reg when slow rewind when near locate point.

5) When unthread, turn off thread motor after zero direction bits

6) If near end-of-tape, sometimes there would not be enough tape to complete the threading action. Now we continually check for end-of-tape while threading. If end-of-tape sensed, then the tape is unthreaded, rewound, and re-threaded.

Changes/additions:

1) New brakes: Changes made to accommodate the new soft brake torque. This affects ***all*** transport operations (threading, unthreading, rew, fwd, play, stop, locate, sync, etc.)

2) Power-on reset: When perform power-on reset, the display now indicates that a reset has occurred - "Init" for user reset (Play and Record held on power-up) and "HArd" for real hard reset.

3) Looping for testing: Unlimited loop function and loop count display added. Enter infinite loop mode by holding SetLocate and pressing Auto2->1. The display will temporarily display "inF". It will automatically revert to fixed loop limit mode when Stop, Fwd, Rew, or Eject is pressed. Holding SetLocate and pressing AutoPlay will display the number of loops (maximum = 9999).

4) Single button punch-out: Pressing the PLAY button while recording now performs a punch-out.

5) Add tolerance for independent slave operation with BRC

6) Add tape start and tape end to tape location response type.

7) BRC-related functions (speed regulation, tape location update, new sysex commands)

02/5/93 3.01 Checksum (int = D78BH; ext = D6EFH)

Fixes:

1) Add additional timeout when reversing the threading motor when engaging the tape.

2) Locating to play would sometimes rew/fwd past the master tape location and declare its independence. This has been fixed.

3) Machines would lock when a full output queue was encountered. (most likely to happen on first ADAT connected to BRC that was sending multiple transport commands in quick succession) This has been fixed.

4) Tape data: Make sure VU meters muted when both reading and writing data to tape.

5) If playing and within 3 minutes of locate point and immediately press auto input button after initiating the locate, junk audio could be heard. This has been fixed.

6) Transport oddities would occur if received deferred play via the BRC when very close to locate point. This has been fixed.

Changes/additions:

1) Don't display "FAD" message when change crossfade time externally. (Still displays if changed from the front panel)

2) Add interpolation error sysex communication.

3) Change writing data to tape so as to allow data to be written to multiple units simultaneously.

4) Master echos commands intended for other devices and slaves ignore response messages.

5) Change 1ms interrupt to 1.024ms

6) Scan mode: REW/PLAY and FWD/PLAY switch combinations are now latched (i.e. no need to hold switches in order to remain in scan mode) from both front panel and LRC. This is consistent with how the BRC operates.

7) When under BRC control, don't return to absolute mode when tape is ejected.

8) ADAT tape counter now accurately follows the BRC tape counter when in relative mode.

03/18/93 3.02 Checksum (ext = 4E8BH)

Fixes:

1) Mute data section during scan.

2) Wrapped fwd/rew from "Lead" section would sometimes display "Lead" through "data" section. This has been fixed.

3) Capstan test: No longer need to thread tape first before hitting play.

Changes/additions:

1) Allow for quick BRC-ADAT play initialization through use of new sysex communication.

2) Display 44.1 at pitch -147.

3) Increase MIDI input queue from 1Kbytes to 4Kbytes.

4) Data/Audio* signal held high when reading data from tape for new A/D/A board.

5) Allow selection of tape type through sysex communication.

6) Allow digital copy of data section during complete format.

7) For authorized service centers only: Change the way of initiating the drum head time (holding Record and Stop while powering up the ADAT now does nothing). Must now hold port 1 bit 7 of the microprocessor low (U14 pin 9) during power-up.

APPENDIX D
ADAT PARTS LIST

APPENDIX E
ADAT QC TEST PROCEDURE

ADAT QC TEST PROCEDURE

1. Prerequisites

Complete these checks prior to the start of the QC Test Procedure.

1.1. Verify that all hardware modifications have been completed for the ADAT under test. Refer to Appendix B of the ADAT Service Manual for a description of the current hardware modifications.

1.2. Verify that the current version of software is installed in the ADAT. Refer to Appendix C of the ADAT Service Manual for a description of the ADAT Software History.

1.3. Record the serial number of the ADAT being tested on the data sheet provided.

1.4. Record the time at which the test was started on the data sheet.

1.5. Power up the ADAT.

1.6. Press **SET LOCATE** and **STOP** at the same time and record the Drum Hours on the data sheet.

1.7. Power down the ADAT.

1.8. Clean the heads and tape path. Refer to section 4.6 for details on cleaning the transport

2. ADAT Self Tests

This section details the conduct of the various ADAT Self Tests. For information on these tests, see Section 4.4 of the ADAT Service Manual.

2.1. Set Up

2.1.1. Connect the sync cable to the "Sync In" and "Sync Out" connectors located on the back of the ADAT.

2.1.2. Connect the fiber optic cable to the "Digital In" and "Digital Out" connectors located on the back of the ADAT.

2.1.3. Connect the LRC to the appropriate connector located on the back of the ADAT.

2.1.4. Press **RECORD 1** and **RECORD 7** simultaneously while applying power to the ADAT.

2.1.5. Verify that the ADAT front panel displays "ProG." If the front panel displays "AdAt", Power down and repeat step 2.1.4 until "ProG." is displayed.

2.2. ROM Self Test.

2.2.1. Press **AUTO PLAY**.

2.2.2. Verify that the ADAT front panel displays "PASS" temporarily followed by "ProG.".

2.2.3. If the ADAT front panel displays "F-ro", then the unit fails it's ROM Self Test.

2.2.4. Record the results of this test on the data sheet.

2.3. RAM Self Test.

2.3.1. Press **PITCH Δ** and verify that the ADAT front panel displays "dAtA.".

2.3.2. Press **AUTO PLAY**.

2.3.3. Verify that the ADAT front panel displays "PASS" temporarily followed by "dAtA.".

2.3.4. If the ADAT front panel displays "F-ra", then the unit fails it's RAM Self Test.

2.3.5. Record the results of this test on the data sheet.

2.4. LED Self Test.

2.4.1. Press **PITCH Δ** and verify that the ADAT front panel displays "LEdS."

2.4.2. Press **AUTO PLAY**.

2.4.3. Verify that the LEDs light in the following order: record enable 1-8, mode functions, transport functions, and finally all segments of the front panel display. Verify that the front panel displays "LEdS." after completion of this test.

2.4.4. If some of the LEDs do not light, then the unit fails it's LED Self Test.

2.4.5. Record the results of this test on the data sheet.

2.5. Sync I/O Self Test.

2.5.1. Press **PITCH Δ** and verify that the ADAT front panel displays "InOt."

2.5.2. Press **AUTO PLAY.**

2.5.3. Verify that the ADAT front panel displays "PASS" temporarily followed by "InOt.".

2.5.4. If the ADAT front panel displays "F-io", then the unit fails it's Sync I/O Self Test.

2.5.5. Record the results of this test on the data sheet.

2.6. Front Panel Button Self Test.

2.6.1. Press **PITCH Δ** and verify that the ADAT front panel displays "butn."

2.6.2. Press **AUTO PLAY** and verify that the decimal point turns off.

2.6.3. Press each button on the front panel.

2.6.4. For every button pressed, verify that the ADAT front panel displays the appropriate function as described in the table below.

2.6.5. If any button pressed displays an erroneous message, then the unit fails its Front Panel Button Test.

2.6.6. Record the results of this test on the data sheet.

2.6.7. Press **PITCH Δ** and **PITCH ∇** simultaneously.

2.6.8. Verify that the ADAT front panel displays "butn.".

2.6.9. If the ADAT does not display "butn.", then repeat step 2.6.7 until "butn." is displayed.

Button	**ADAT Display**	**Button**	**ADAT Display**
Record1	**rc 1**	Eject	**EJCt**
Record2	**rc 2**	Auto Input	**Auto**
Record3	**rc 3**	All Input	**ALin**
Record4	**rc 4**	Format	**For**
Record5	**rc 5**	Digital In	**DiGt**
Record6	**rc 6**	Pitch up	**PiUP**
Record7	**rc 7**	Pitch Down	**Pidn**
Record8	**rc 8**	Locate 1	**Loc1**
Rewind	**rEud**	Set Locate	**SEt**
Fast Fwd	**FFd**	Locate 2	**Loc2**
Stop	**StOP**	Locate 0	**Loc0**
Play	**PLAy**	Auto 2➤1	**A2-1**
Record	**rECd**	Auto Play	**APLy**

2.7. Back Panel Button Test.

2.7.1. Press **PITCH Δ** and verify that the ADAT front panel displays "Lrc."

2.7.2. Press **AUTO PLAY** and verify that the decimal point turns off.

2.7.3. Press each button on the LRC.

2.7.4. For every button pressed, verify that the ADAT front panel displays the appropriate function as described in the table below.

2.7.5. If any button pressed displays an erroneous message, then the unit fails its Back Panel Button Test.

2.7.6. Record the results of this test on the data sheet.

2.7.7. Press **PITCH Δ** and **PITCH ∇** simultaneously.

2.7.8. Verify that the ADAT front panel displays "lrc.".

2.7.9. If the ADAT does not display "lrc.", then repeat step 2.7.7 until "lrc." is displayed.

Number	Function	Number	Function
3.	**All Input**	4.	**Play/Stop**
5.	**Auto Input**	6.	**Play/Rewind**
7.	**Auto 2>1**	8.	**Play/Forward**
9.	**Locate 2**	10.	**Play/Record**
11.	**Locate 1**	12.	**Play**
13.	**Locate 0**	14.	**Stop**
15.	**Auto Play**	16.	**Rewind**
17.	**Set Locate**	18.	**Fast Forward**
		19.	**Record**

2.8. Digital I/O Test

2.8.1. Press **PITCH Δ** and verify that the ADAT front panel displays "diG."

2.8.2. Press **AUTO PLAY** and verify that the decimal point turns off.

2.8.3. Insert the Digital I/O Test tape into the ADAT and press PLAY. NOTE: During this portion of the test, the ADAT front panel display will contain a blinking decimal point. This is a normal condition and does not indicate errors.

2.8.4. Verify that channels 3, 5, and 7 contain the same audio as track 1.

2.8.5. Verify that channels 4, 6, and 8 contain the same audio as track 2.

2.8.6. Verify that the audio on channels 7 and 8 is delayed respective to channels 1 and 2.

2.8.7. If any of the channels do not contain audio, or channels 7 and 8 are not delayed, then the unit fails it's Digital I/O Test.

2.8.8. Place you finger on the pins of the right side of U46. Verify that channels 3 thru 8 are "cut out" and no longer match the audio of tracks 1 and 2.

2.8.9. Remove your finger and verify that the audio returns to channels 3 through 8.

2.8.10. Record the results of this test on the data sheet.

2.8.11. Press **EJECT**

2.8.12. Press **PITCH Δ** and **PITCH ∇** simultaneously.

2.8.13. Verify that the ADAT front panel displays "diG.".

2.8.14. If the ADAT does not display "diG.", then repeat step 2.8.12 until "diG." is displayed.

2.8.15. Press **PITCH Δ** and verify that the ADAT front panel displays "CAP."

3. Capstan/Pinch Roller Gap Adjustment

The Capstan/Pinch Roller Gap will be checked and adjusted, if necessary. For information on this test, see Section 4.4 of the ADAT Service Manual.

3.1. If test 2 has just been completed, skip step 3.2

3.2. Press **RECORD 1** and **RECORD 7** simultaneously while applying power to the ADAT. Verify that the ADAT front panel displays "ProG." Press **PITCH Δ** repeatedly until the ADAT front panel displays "CAP."

3.3. Press **AUTO PLAY** and verify that the decimal point turns off.

3.4. Press **PITCH ∇** to lower the carriage into the transport. Note that sometimes the carriage will not lower into the transport because of tape sensing latches at the top of the transport housing (Point A of Fig. 1). If this situation occurs, wait for the carriage to return to its normal position, then physically move these latches up with your fingers while pressing the **PITCH ∇** button. The carriage should now move freely into the correct position.

3.5. Press **STOP**, then **PLAY**, then **STOP**. Note that if you go directly to **PLAY** without pressing **STOP**, the ADAT will lock up. If this happens, power down the ADAT and repeat step 3.2 through 3.5.

3.6. Verify that the gap between the capstan and the pinch roller after going from **PLAY** to **STOP** is between 0.7mm and 1.0mm. If required, adjust the capstan pinch/roller gap switch in accordance with the methods described in section 5.1.2 of the ADAT Service Manual.

3.7. If the gap is adjusted in step 3.6, then repeat step 3.5 and 3.6.

3.8. Repeat steps 3.5 through 3.7 until the gap is within specified limits for three consecutive measurements.

3.9. Record the results of this test on the data sheet.

3.10. Press **PITCH Δ** and **PITCH ∇** simultaneously to raise the carriage out of the transport and verify that the ADAT front panel displays "CAP.".

3.11. Press **PITCH Δ** and verify that the ADAT front panel display reads "LOAd."

4. Cassette Load Test

The Cassette Load Test verifies that the Cassette Present switch is set to its correct position. For information on this test, see Section 4.4 of the ADAT Service Manual.

4.1. If test 3 has just been completed, skip step 4.2

4.2. Press **RECORD 1** and **RECORD 7** simultaneously while applying power to the ADAT. Verify that the ADAT front panel displays "ProG." Press **PITCH Δ** repeatedly until that the ADAT front panel displays "LOAd."

4.3. Press **AUTO PLAY** and verify that the decimal point turns off.

4.4. While inserting a cassette, monitor the RECORD LED.

4.5. Verify that when the LED illuminates, the white carriage roller is above a stamped circle located on the left side of the transport housing. ??

4.6. If the LED does not illuminate at the specified point, adjust the cassette present switch in accordance with the methods described in section 5.1.3.

4.7. Repeat steps 4.5 and 4.6 until the LED illuminates at the specified point.

4.8. Record the results of this test on the data sheet.

4.9. Press **PITCH Δ** and **PITCH ∇** simultaneously and verify that the ADAT front panel displays "LOAd.".

4.10. Press **PITCH Δ** three times and verify that the ADAT front panel display reads "dONE."

4.11. Press **AUTO PLAY** and verify that the display reads "AdAt" or "----".

5. Brake Torque Test

This test verifies that the brake torque is within specified limits. For information on brake torque, see Section 4.3 of the ADAT Service Manual.

5.1. Verify that there is no cassette present in the transport.

5.2. Press **SET LOCATE** and **REWIND** simultaneously.

5.3. Verify that the ADAT front panel displays "tor". Note that the "tor" mode lasts for only 5 seconds after which "AdAt" will be displayed.

5.4. Measure the brake torque for each hub with the Torque Guage.

5.5. Verify that the brake torque for each hub is between 50 and 70 grams.

5.6. Record the brake torque measurement for each hub on the data sheet.

6. End Sensors and Write Protect Test

This test verifies that the end sensors and write protect tab are functioning correctly. For information on end sensors and the write protect tab, see Section 4.6 of the ADAT Service Manual.

6.1. Write Protect Test.

6.1.1. Insert the Short Tape into the ADAT and press **LOCATE 0**.

6.1.2. Place all tracks in record ready by pressing **RECORD1** through **RECORD8**. Verify that all record enable LEDs are lit.

6.1.3. Press **PLAY**.

6.1.4. Press **PLAY** and **RECORD** simultaneously a few times. Verify that the ADAT front panel displays "Prot" every time **PLAY** and **RECORD** is pressed.

6.1.5. If the RECORD LED remains lit after **PLAY** and **RECORD** has been pressed, then the unit fails its write protect test.

6.1.6. Record the results of this test on the data sheet.

6.2. End Sensors Test.

6.2.1. Insert the Short Tape into the ADAT and press **LOCATE 0**.

6.2.2. Press **STOP** to disengage the tape from the heads.

6.2.3. Press **FAST FWD**.

6.2.4. Verify that the STOP LED lights when the tape reaches its leader.

6.2.5. If the FAST FWD LED remains lit after the tape has stopped moving, then the unit fails its end sensors test.

6.2.6. Press **REWIND**.

6.2.7. Verify that the STOP LED lights when the tape reaches its leader.

6.2.8. If the REWIND LED remains lit after the tape has stopped moving, then the unit fails its end sensors test.

6.2.9. Press **EJECT** and remove the tape.

6.2.10. Record the results of this test on the data sheet.

7. Servo Control Adjustment

This procedure sets the proper voltage levels for the Drum and Capstan servos. For information on servos, see Section 3.7.10.2 of the ADAT Service Manual. ???

7.1. Oscilloscope Set Up

7.1.1. Channel 1

- Place probe on Test Point 3 (TP3) of the Processor PCB.
- Set to 0.5 Volts/Div.
- Use DC Coupling
- Use the POSITION knob to set the GND trace on the first division line from the bottom of the scope display.

7.1.2. Channel 2

- This channel is not used during this adjustment.

7.1.3. Trigger

- Place probe on Test Point 6 (TP6) of the Processor PCB.
- Set to 2 ms/Div.
- Use EXT Trigger Source
- Use DC Coupling
- Use AUTO Mode

7.1.4. Vert. Mode

- Set Ch. 1 to ON
- Set Ch. 2 to OFF

- Use 20 MHz Bandwidth Limit

7.2. Drum Servo Speed Adjustment

7.2.1. Insert a formatted tape into the ADAT and press **PLAY**.

7.2.2. Monitor the DC Voltage off of TP3 on the Oscilloscope.

7.2.3. Verify that the Drum FG voltage is 2.5V ± 0.2V.

7.2.4. Adjust this voltage by turning R148 on the Processor PCB with a small plastic screwdriver.

7.2.5. Record the DC Voltage of the Drum FG on the data sheet.

7.3. Capstan Servo Speed Adjustment

7.3.1. Move the channel 1 probe from TP3 to TP5 of the Processor PCB.

7.3.2. Insert the Alesis Alignment Tape into the ADAT and press **PLAY**.

7.3.3. Monitor the DC Voltage off of TP5 on the Oscilloscope.

7.3.4. Verify that the Cap FG voltage is 2.5V ± 0.2V.

7.3.5. Adjust this voltage by turning R149 on the Processor PCB with a small plastic screwdriver.

7.3.6. Record the DC Voltage of the Cap FG on the data sheet.

8. WRCV Adjustment

This procedure sets the proper Write Read Control Voltage (WRCV). For information on the WRCV, see Section 3.7.10.1 of the ADAT Service Manual. ?

8.1. Oscilloscope Set Up

8.1.1. Channel 1

- Place probe on Test Point 13 (TP13) of the Processor PCB.
- Set to 0.5 Volts/Div.
- Use DC Coupling
- Use the POSITION knob to set the GND trace on the first division line from the bottom of the scope display.

8.1.2. Channel 2

- This channel is not used during this adjustment.

8.1.3. Trigger

- Same As Step 7.1.3

8.1.4. Vert. Mode

- Same As Step 7.1.4

8.2. WRCV Adjustment

8.2.1. Insert a formatted tape into the ADAT and press **PLAY**.

8.2.2. Monitor the DC Voltage off of TP13 on the Oscilloscope.

8.2.3. Verify that the WRCV voltage is 3.0V ± 0.1V.

8.2.4. Adjust this voltage by turning L2 on the Processor PCB with the L2, L3 Alignment Tool.

8.2.5. Press **EJECT** and remove the alignment tape.

8.2.6. Record the DC Voltage of the WRCV on the data sheet.

9. Preliminary Tape Path Alignment

A rough tape alignment is performed so tape tension can be properly set. For information on tape path alignment, see Section 4.3 of the ADAT Service Manual.

9.1. Oscilloscope Set Up

9.1.1. Channel 1

- Place probe on Test Point 1 (TP1) of the Read-Pre 2 PCB.
- Set to 0.5 Volts/Div.
- Use AC Coupling
- Use the POSITION knob to set the GND trace to the center of the scope display.

9.1.2. Channel 2

- This channel is not used during this adjustment.

9.1.3. Trigger

- Same As Step 7.1.3

9.1.4. Vert. Mode

- Same As Step 7.1.4

9.2. P1 Alignment

This procedure aligns the P1 post to its correct height

9.2.1. Insert a small hub cassette into the ADAT and press **PLAY.**

9.2.2. While the tape is moving past the P1 post, carefully move the tape off the guide at a location between P1 and the impedance roller (point B as labeled on Fig. 1). The tape can be moved off the P1 post easily with the shaft portion of the Linear Head Tool.

9.2.3. Verify that the tape does not stick on the top or bottom of the P1 post when the tape is moved off the post. If it does, use the linear head tool to move the P1 post up or down until the above condition is met.

9.2.4. Record the results of this test on the data sheet.

9.3. P4 alignment

This procedure aligns the P4 post of the tape path to its correct height. Note that this is a visual check and it may be difficult to see at first. However, once the visual "trick" is observed, setting P4 becomes very simple.

9.3.1. Insert a small hub cassette into the ADAT and press **PLAY.**

9.3.2. Shine a light into the transport on the right hand side of the P4 post.

9.3.3. While the tape is moving, lift the cassette protective cover off the white cap and look down at the bottom of the P4 post (point C as labeled on fig. 1).

9.3.4. Verify that some light escapes from the bottom of the post as the tape travels past it.

9.3.5. If no light is observed, then follow the procedure detailed below to set the P4 post to its proper position.

9.3.5.1. Press **EJECT** and remove the tape.

9.3.5.2. Remove the white cap from the P4 post with a pair of needle nose pliers.

Note: Make sure that the drum has stopped spinning prior to removing the cap to prevent any damage to the drum in case the cap slips out of the pliers and into the transport.

9.3.5.3. Once the cap is removed (you may also want to remove any excess Three Bond from the P4 post), insert the tape and press **PLAY.**

9.3.5.4. Using the linear head tool, adjust the P4 post until you see some light escaping from the bottom of the post.

9.3.5.5. Adjust P4 downward until the light just disappears. This is now your reference point.

9.3.5.6. From the reference point just established, adjust P4 1/4 turn upwards. Light should now be escaping from the bottom of the P4 post.

9.3.5.7. Press **EJECT** and remove the tape.

9.3.5.8. Replace the white cap onto the post so that the angled portion of the cap is in the front facing the cassette. Make sure that you apply some Three Bond to the post prior to the installation of the white cap.

9.3.5.9. Once the cap is properly installed, verify the P4 setting by repeating steps 9.3.1 through 9.3.4.

9.3.6. Record the results of this test on the data sheet.

9.4. Rough Alignment.

This procedure details the steps involved in setting up a rough alignment of the ADAT to aid in checking tape tension.

> Note that the envelope displayed on the oscilloscope is a composite of all 8 tracks. Also note that each display corresponds to one complete drum revolution. By pushing the "Trigger View" button on the scope, you can observe the PG signal. If the time base is set correctly, the PG High portion will be displayed in the left half of the scope display and PG Low will be displayed on the right half of the display. Therefore, one read head passes during the PG High cycle and the other read head passes during the PG Low cycle.

9.4.1. Insert a formatted tape into the ADAT and press **PLAY**.

9.4.2. Observe the envelope on the oscilloscope display.

9.4.3. Adjust the conical screw (Point D of fig. 1) with the linear head alignment tool until a maximum amplitude is reached on the scope display.

9.4.4. Verify that the envelope is relatively flat across the display.

9.4.5. If there is a dip in the envelope amplitude on the left side of the scope display, use the P2, P3 alignment tool to adjust P2 until a flat envelope is displayed on the left side.

9.4.6. If there is a dip in the envelope amplitude on the right side of the scope display, use the P2, P3 alignment tool to adjust P3 until a flat envelope is displayed on the right side.

9.4.7. Press **EJECT** and remove the alignment tape.

10. Tape Tension Adjustment

This section describes the methods involved in measuring tape tension. For information on tape tension, see Section 4.3 of the ADAT Service Manual.

10.1. Oscilloscope Set Up

10.1.1. Channel 1

- Place probe on Test Point 5 (TP5) of the Processor PCB.
- Set to 0.5 Volts/Div.
- Use DC Coupling
- Use the POSITION knob to set the GND trace on the first division line from the bottom of the scope display.

10.1.2. Channel 2

- This channel is not used during this adjustment.

10.1.3. Trigger

- Same as section 7.1.3

10.1.4. Vert. Mode

- Same as section 7.1.4

10.2. Insert the tension tape into the ADAT.

10.3. Locate the tape between 18 and 20 minutes as displayed on the front panel and press **SET LOCATE** and **LOCATE 1** simultaneously.

10.4. Press **PLAY**.

10.5. While the tape is moving, insert a calibrated tension gauge between the P1 post and the impedance roller (point B on Fig. 1). Be careful to place the tension gauge in a manner such that the tape path is not moved to the right or left of its normal travel. Also, be sure that the tension gauge posts are not coming in contact with the write cable that connects the Rotor to the Processor PCB.

10.6. Measure the tape tension as indicated on the tension gauge and verify that it is between 23 and 28 grams and that the tension fluctuation is no more than 3 grams.

10.7. If the tape tension is not within the specified range, press **EJECT**, remove the tape and adjust the tension band. Refer to section 5.1.1 for details on adjusting the tension band.

10.8. Insert the tension tape once again and press **LOCATE 1** on the front panel.

10.9. Repeat steps 10.4 through 10.8 until the tension is within the specified range.

10.10. Press **LOCATE 1** on the front panel.

10.11. Press **PLAY** on the front panel.

10.12. While the tape is moving, insert the tension gauge between the P3 post and the linear head (point E on Fig. 1). Be careful to place the tension gauge in a manner such that the tape path is not moved to the right or left of its normal travel.

10.13. Measure the tape tension as indicated on the tension gauge and verify that it is between 60 and 75 grams. This measurement is not critical, but if the tension is lower than 50 grams or higher than 85 grams, it may be an indication that some other part of the transport is not aligned correctly.

10.14. Locate the tape between 38 and 40 minutes as displayed on the front panel and press **SET LOCATE** and **LOCATE 2** simultaneously.

10.15. Press **PLAY** on the front panel.

10.16. While the tape is moving, insert the tension gauge between the P1 post and the impedance roller (point B on Fig. 1) while observing the cautions outlined in step 10.5.

10.17. Measure the tape tension as indicated on the tension gauge and verify that it is between 30 and 35 grams and that the tension fluctuation is no more than 5 grams.

10.18. If the tension is above or below the specified range for this part of the tape, or if the fluctuation is greater than 5 grams, it may be an indication that some other part of the transport is aligned incorrectly.

10.19. Monitor the Cap FG signal on the oscilloscope. Verify that the waveform deviation is no more than ± 0.5 Volts at any time.

10.20. Press **LOCATE 2**.

10.21. Repeat steps 10.5 through 10.20 until the tape tension is within the specified range for both tape locations.

10.22. Record the tape tension at both tape locations on the data sheet.

10.23. Press **EJECT**, remove the tape and apply Three Bond to the Phillips head screw that holds the tension band in place.

11. Final Tape Path Adjustment

This procedure will detail the final adjustments required for proper tape path alignment. For information on tape path alignment, see Section 4.3 of the ADAT Service Manual.

11.1. Oscilloscope Set Up

11.1.1. Channel 1

- Same as Step 9.1.1

11.1.2. Channel 2

Probe will monitor cathode of D14 on the Processor PCB.

- Set to 2.0 Volts/Div.
- Use DC Coupling
- Use the POSITION knob to set the GND trace on the first division line from the bottom of the scope display.

11.1.3. Trigger

- Same As Step 7.1.3

11.1.4. Vert. Mode

- Set Ch. 1 to ON
- Set Ch. 2 to ON
- Use 20 MHz Bandwidth Limit

11.2. Linear Head Maximization

11.2.1. Insert the Alesis Alignment Tape into the ADAT and press **PLAY**.

11.2.2. Monitor the output voltage of D14 on the Processor PCB with the oscilloscope.

11.2.3. Adjust the linear head azimuth by turning the Phillips head screw located at the bottom of the linear head assembly (point F of Fig. 1) until a narrow spike is observed on the oscilloscope.

11.2.4. Adjust the linear head height by turning the vertical adjustment nut (point G of Fig. 1) with the linear head adjustment tool until a maximum amplitude of the voltage spike is observed on the oscilloscope.

11.2.5. Verify that the voltage of the spike is at least 0.5 volts.

11.2.6. Record the voltage off of D14 on the data sheet.

11.3. Envelope Flatness

11.3.1. Uncalibrate channel 1 of the scope and adjust the PG High envelope to 3 Volts p-p.

11.3.2. Place your index finger against the linear head vertical adjustment nut (point G of fig. 1) and move the linear head assembly forward with your thumb. The envelope amplitude should decrease.

11.3.3. Continue moving the linear head until the maximum portion of the envelope measures 1.5 Volts p-p.

11.3.4. Verify that no portion of the envelope is less than 0.5 Volts p-p.

11.3.5. If the above condition is not met, adjust the P2 post (to flatten the left side of envelope) or P3 post (to flatten the right side of envelope) with the P2, P3 adjustment tool.

11.3.6. Repeat steps 11.3.2 through 11.3.5 until the above conditions are met.

11.3.7. Release the linear head back to its normal position.

11.3.8. Repeat steps 11.3.2 through 11.3.7 for the PG Low envelope.

11.3.9. Re-calibrate channel 1 of the oscilloscope.

11.3.10. Record the results of this test on the data sheet.

11.4. Envelope Amplitude

11.4.1. Monitor the envelope on the oscilloscope.

11.4.2. Using the Linear head alignment tool, adjust the conical screw below the linear head assembly (point D of fig. 1) until the envelope amplitude on the oscilloscope reaches its maximum.

11.4.3. Verify that the envelope amplitude for both the PG High and PG Low cycles is greater than the values written onto the alignment tape label.

11.4.4. Record the amplitude for the PG High and PG Low envelopes on the data sheet.

11.5. Envelope Deviation

11.5.1. Determine which envelope has the greatest amplitude (PG High or PG Low).

11.5.2. If the PG Low envelope has the greatest envelope, reverse the trigger slope so the PG Low envelope is now displayed on the left side of the oscilloscope.

11.5.3. Uncalibrate channel 1 of the scope and adjust the maximum envelope amplitude so it fills the 0% to 100% scale found along the left side of the oscilloscope.

11.5.4. Verify that the peak-to-peak amplitude of the lower amplitude envelope is not less than the 25% to 75% scale found along the left side of the oscilloscope.

11.5.5. If the lower amplitude is less than specified above, Adjust the conical screw until the two envelopes approach the same amplitude. Make sure that the minimum amplitude still remains above the limits specified on the Alignment tape label.

11.5.6. Repeat steps 11.5.1 through 11.5.4 until the above conditions are met.

11.5.7. Re-calibrate channel 1 of the oscilloscope.

11.5.8. Reset the trigger slope, if adjusted in step 11.5.2

11.5.9. Record the results of this test on the data sheet.

11.6. PG Delay Offset

11.6.1. Set up the "B Delay" function on the oscilloscope to 2μs per division.

11.6.2. Push the "Trigger View" button on the scope and verify that the PG signal is displayed along with the envelope.

11.6.3. Push the "B delay" button on the scope.

11.6.4. Locate the point where the PG signal transitions from high to low. Verify that a small header exists between the two halves of the envelope. This is the PG delay timing marker.

11.6.5. Verify that the left edge of the PG delay timing marker is less than ± 5μs from the transition of PG high to PG low. This is the PG Delay Offset.

11.6.6. If the PG Delay offset is greater than the amount specified, use a small plastic screwdriver to adjust R147 until the offset is within range.

11.6.7. Record the value of the PG Delay Offset on the data sheet.

11.6.8. Push the "A" button on the scope to return to the normal view of the envelope.

11.7. Final Check

11.7.1. Press **STOP**, then **FAST FWD** and after a few seconds, press **PLAY**.

11.7.2. Verify that the full envelope is displayed on the scope within 1 second . Verify that no "dips" or "bows" are present and the envelope is flat.

11.7.3. Press **STOP**, then **REWIND** and after a few seconds, press **PLAY**.

11.7.4. Repeat step 11.7.2

11.7.5. Press **STOP** twice to disengage the tape from the heads, then press **REWIND** and after a few seconds, press **PLAY**

11.7.6. Repeat step 11.7.2.

11.7.7. Record the results of this test on the data sheet.

12. Crosstalk Test and Envelope Gap Check

This procedure will check crosstalk within the ADAT. Additionally, this test will check that the gap between the PG High and PG Low envelopes is within specified limits.

12.1. Crosstalk Test

12.1.1. Oscilloscope Set Up

12.1.1.1. Channel 1

- Place probe on Test Point 2 (TP2) of the Read-Pre 2 PCB.
- Set to 50 millivolts/Div.
- Use AC Coupling

12.1.1.2. Channel 2

- Place probe on Test Point 3 (TP3) of the Read-Pre 2 PCB.
- Set to 50 millivolts/Div.
- Use AC Coupling

12.1.1.3. Trigger

- Same As Step 7.1.3

12.1.1.4. Vert. Mode

- Set Ch. 1 to OFF
- Set Ch. 2 to OFF
- Set ADD to ON
- Use the POSITION knob of Ch. 1 to set the GND trace to the center of the scope display.
- Use 20 MHz Bandwidth Limit

12.1.2. Insert an unformatted tape into the ADAT.

12.1.3. Press the **FORMAT** button on the front panel and press **PLAY** and **RECORD** simultaneously. After 5 seconds, press **SET LOCATE** and **LOCATE 1**

12.1.4. While the tape is formatting, measure the peak voltage for each write head displayed on the oscilloscope. One voltage reading for PG High and another for PG Low. Record these voltages on the data sheet.

12.1.5. After 30 to 45 seconds, press **STOP**. Then press **LOCATE 1**.

12.1.6. Set each channel of the oscilloscope to 0.5 Volts/div.

12.1.7. Press **PLAY** and measure the minimum voltage for each read head displayed on the oscilloscope. One voltage reading for PG High and another for PG Low.

12.1.8. Referring to the chart shown in figure 2, verify that the crosstalk is above the "14 dB" line for both the PG High and PG Low readings.

12.1.9. If the crosstalk is not above the "14 dB" line as shown in figure 2, perform the following steps to bring the crosstalk within specified limits.

12.1.9.1. Set each channel of the oscilloscope to 50 millivolts/div.

12.1.9.2. Repeat steps 12.1.2 and 12.1.3.

12.1.9.3. While the tape is formatting, verify that both the PG High and PG Low voltage readings are relatively the same. If not, use a small screwdriver to adjust the pot on the rotor until the two voltages are relatively the same.

12.1.9.4. Repeat steps 12.1.4 through 12.1.8

12.1.10. If the crosstalk still lies below the "14 dB" line of figure 2, then power down the ADAT and swap the wires which lead from the upper drum to the rotor. Then repeat step 12.1.9.1 through 12.1.9.4

12.1.11. There are 4 possible wire combinations on the rotor. Try all of these combinations until crosstalk falls below the "14 dB" line of figure 2.

12.2. Envelope Gap Test

12.2.1. Oscilloscope Set Up

12.2.1.1. Channel 1

- Place probe on Test Point 1 (TP1) of the Read-Pre 2 PCB.
- Set to 0.5 Volts/Div.
- Use AC Coupling
- Use the POSITION knob of Ch. 1 to set the GND trace to the center of the scope display.

12.2.1.2. Channel 2

- Not used durnig this test.

12.2.1.3. Trigger

- Same As Step 7.1.3

12.2.1.4. Vert. Mode

- Set Ch. 1 to ON
- Set Ch. 2 to OFF
- Set ADD to OFF
- Use 20 MHz Bandwidth Limit

12.2.2. Using the same cassette as in step 12.1, press **LOCATE 1** and then press **PLAY.**

12.2.3. Verify that an envelope exists for both PG High and PG Low.

12.2.4. Set up the "B Delay" function on the oscilloscope to 50μs per division.

12.2.5. Push the "Trigger View" button on the scope and verify that the PG signal is displayed along with the envelope.

12.2.6. Push the "B delay" button on the scope.

12.2.7. Locate the point where the PG signal transitions from high to low.

12.2.8. Measure the length of time from the PG High/PG Low transition to the point where the PG High envelope amplitude reaches 1.5 Volts p-p. This is the Envelope Gap.

12.2.9. Verify that the Envelope Gap is less than 300μs.

13. VCO Adjustment and Error Rate Minimization

This procedure will detail the adjustments to the VCO circuitry and the method of minimizing the error rate within the ADAT. For information on VCO circuitry, see Section 3.7.10.1 of the ADAT Service Manual. ?

13.1. Oscilloscope Set Up

13.1.1. Channel 1

- Place probe on Test Point 9 (TP9) of the Processor PCB.
- Set to 0.5 Volts/Div.
- Use DC Coupling
- Use the POSITION knob to set the GND trace to the middle of the scope display.

13.1.2. Channel 2

- Place probe on Test Point 21 (TP21) of the Processor PCB.
- Set to 1.0 Volts/Div.
- Use DC Coupling
- Use the POSITION knob to set the GND trace on the first division line from the bottom of the scope display.

13.1.3. Trigger

- Same As Step 7.1.3

13.1.4. Vert. Mode

- Same as step 11.1.4

13.2. Error Rate Minimization

13.2.1. Insert an "Overwrite" tape into the ADAT and press **PLAY**.

13.2.2. Verify that the signal on TP9 measures 1.5 Volts.

13.2.3. If the voltage is not at the specified level, adjust L3 with the L2, L3 adjustment tool until 1.5 Volts is achieved.

13.2.4. Install a jumper between Test Point 4 (TP4) on the Read-Pre 2 PCB and Test Point 20 (TP20) on the Processor PCB.

13.2.5. Using the small plastic screwdriver, adjust R226 until the signal from TP21 measures 1.0 Volt on the scope.

13.2.6. Adjust the LOW EQ pot on the Read Pre-2 PCB with a small plastic screwdriver while observing the signal on TP21. Adjust this pot until the voltage level from TP21 is at its minimum level.

13.2.7. Adjust R226 again until TP21 reads 1.0 Volts on the scope

13.2.8. Adjust the SLICE pot on the Read Pre-2 PCB with a small plastic screwdriver while observing the signal on TP21. Adjust this pot until the voltage level from TP21 is at its minimum level.

13.2.9. Adjust R226 again until TP21 reads 1.0 Volts on the scope

13.2.10. Adjust L3 on the Processor PCB with the L2, L3 adjustment tool while observing the signal on TP21. Adjust this pot until the voltage level from TP21 is at its minimum level.

13.2.11. Repeat step 13.2.8.

13.2.12. Repeat step 13.2.7.

13.2.13. Repeat step 13.2.6.

13.2.14. Record the final voltage of the Read VCO on the data sheet.

13.2.15. Remove the jumper.

13.3. Read VCO Phase Adjustment

13.3.1. Press **SET LOCATE** and **PITCH Δ** simultaneously. The ADAT should speed up and eventually stabilize at speed +200.

13.3.2. Verify that the signal on TP9 does not deviate more than ± 0.25 Volts from the level set in step 13.2.14

13.3.3. If the deviation measured above is greater than the specified limit, adjust R222 with a small plastic screwdriver until the limit is achieved.

13.3.4. Press **SET LOCATE** and **PITCH ∇** simultaneously. The ADAT should slow down and eventually stabilize at speed -300.

13.3.5. Repeat steps 13.3.2 and 13.3.3

13.3.6. Repeat steps 13.3.1 through 13.3.5 until the diviation is less than ±0.25 Volts for both the +200 and -300 speeds.

13.3.7. Press **PITCH Δ** and **PITCH ∇** simultaneously to return to normal speed.

13.3.8. Record the results of this test on the data sheet.

13.3.9. Press **EJECT** and remove the tape.

14. Error Rate Check

This test checks the error rate of the ADAT. A previously formatted tape should be used to conduct this test. An error rate of 1error/second is acceptable. Punch-in errors will also be checked during this test.

14.1. Oscilloscope Set Up

14.1.1. Channel 1

- Place probe on Test Point 1 (TP1) of the Read-Pre 2 PCB.
- Set to 1.0 Volts/Div.
- Use AC Coupling
- Use the POSITION knob to set the GND trace to the second division line from the top of the scope display.

14.1.2. Channel 2

- Place probe on Test Point 8 (TP8) of the Processor PCB.
- Set to 2.0 Volts/Div.
- Use DC Coupling
- Use the POSITION knob to set the GND trace on the first division line from the bottom of the scope display.

14.1.3. Trigger

- Same As Step 7.1.3

14.1.4. Vert. Mode

- Same as step 11.1.4

14.2. Insert formatted tape into the ADAT and press **PLAY**.

14.3. Press the **FORMAT** button on the front panel, then press **RECORD** and **PLAY** simultaneously.

14.4. While the tape is recording, press **SET LOCATE** and **LOCATE 1** simultaneously.

14.5. After recording for 30 seconds, press **SET LOCATE** and **LOCATE 2** simultaneously.

14.6. Press **STOP**, then **LOCATE 1**, then **PLAY**.

14.7. When the tape begins playing over the section formatted in step 14.3, count the number of errors observed on the oscilloscope display.

14.8. Verify that the total amount of errors observed is less 30.

14.9. Verify that no more than one error per second is displayed at the same spot on the oscilloscope.

14.10. Put all tracks into "Record Ready" by pressing **RECORD1** through **RECORD8**. Verify that all channel Record LEDs are lit.

14.11. Press **LOCATE 1**, then **PLAY**.

14.12. Press **PLAY** and **RECORD** simultaneously a number of times. This will perform a punch-in and punch-out.

14.13. Verify that no errors exist during punch-in.

14.14. Press **LOCATE 1**, then **PLAY**.

14.15. Verify that the number of errors observed in step 14.2 has not increased at the part of the tape where the punch-ins were performed.

14.16. Record the results of this test on the data sheet.

15. Track Skipping Test

The Track Skipping Test is performed to verify proper capstan servo operation. For information on this test, see Section 4.4 of the ADAT Service Manual.

↳ 4.6.2.10 pag 20

15.1. Press **RECORD 1** and **RECORD 7** simultaneously while applying power to the ADAT. Verify that the ADAT front panel displays "ProG." Press **PITCH Δ** repeatedly until that the ADAT front panel displays "trc."

15.2. Press **AUTO PLAY** and verify that the decimal point turns off.

15.3. Insert a formatted cassette into the ADAT and press **PLAY**.

15.4. Test 1 - skip +32 tracks at pitch 0

- 15.4.1. Press **RECORD 1.**
- 15.4.2. Verify that the ADAT front panel displays a value between 0 and 3.00.
- 15.4.3. If the front panel displays an error message, repeat step 15.4.1 and 15.4.2 up to a maximum of three times.
- 15.4.4. If three consecutive failures occur, then the unit fails its Track Skipping test.
- 15.4.5. Record the results of this test on the data sheet.

15.5. Test 2 - skip -32 tracks at pitch= 0

- 15.5.1. Press **RECORD 2.**
- 15.5.2. Verify that the ADAT front panel displays a value between 0 and 3.00.
- 15.5.3. If the front panel displays an error message, repeat step 15.5.1 and 15.5.2 up to a maximum of three times.
- 15.5.4. If three consecutive failures occur, then the unit fails its Track Skipping test.
- 15.5.5. Record the results of this test on the data sheet.

15.6. Test 3 - skip +32 tracks at pitch= +100

- 15.6.1. Press **RECORD 3.**
- 15.6.2. Verify that the ADAT front panel displays a value between 0 and 3.00.
- 15.6.3. If the front panel displays an error message, repeat step 15.6.1 and 15.6.2 up to a maximum of three times.
- 15.6.4. If three consecutive failures occur, then the unit fails its Track Skipping test.
- 15.6.5. Record the results of this test on the data sheet.

15.7. Test 4 - skip -32 tracks at pitch= +100

- 15.7.1. Press **RECORD 4.**
- 15.7.2. Verify that the ADAT front panel displays a value between 0 and 3.00.
- 15.7.3. If the front panel displays an error message, repeat step 15.7.1 and 15.7.2 up to a maximum of three times.
- 15.7.4. If three consecutive failures occur, then the unit fails its Track Skipping test.
- 15.7.5. Record the results of this test on the data sheet.

15.8. Test 5 - skip +32 tracks at pitch= -300

- 15.8.1. Press **RECORD 5.**
- 15.8.2. Verify that the ADAT front panel displays a value between 0 and 3.00.
- 15.8.3. If the front panel displays an error message, repeat step 15.8.1 and 15.8.2 up to a maximum of three times.
- 15.8.4. If three consecutive failures occur, then the unit fails its Track Skipping test.
- 15.8.5. Record the results of this test on the data sheet.

15.9. Test 6 - skip -32 tracks at pitch= -300

- 15.9.1. Press **RECORD 6.**
- 15.9.2. Verify that the ADAT front panel displays a value between 0 and 3.00
- 15.9.3. If the front panel displays an error message, repeat step 15.9.1 and 15.9.2 up to a maximum of three times.
- 15.9.4. If three consecutive failures occur, then the unit fails its Track Skipping test.
- 15.9.5. Record the results of this test on the data sheet.

15.10. Press **EJECT**

15.11. Press **PITCH Δ** and **PITCH ∇** simultaneously and verify that the ADAT front panel displays "trc.".

15.12. Press **PITCH Δ** and verify that the ADAT front panel display reads "SSt."

16. Sample Skipping Test

The Sample Skipping Test is performed to verify proper drum servo operation. For information on this test, see Section 4.4 of the ADAT Service Manual.

16.1. If test 15 has just been completed, skip step 16.2

16.2. If test 15 has not just been completed, press **RECORD 1** and **RECORD 7** simultaneously while applying power to the ADAT. Verify that the ADAT front panel displays "ProG." Press **PITCH Δ** repeatedly until that the ADAT front panel displays "SSt."

16.3. Press **AUTO PLAY** and verify that the decimal point turns off.

16.4. Insert a cassette into the ADAT and press **PLAY**.

16.5. Test 1 - skip +480 samples at pitch 0

- 16.5.1. Press **RECORD 1**.
- 16.5.2. Verify that the ADAT front panel displays a value between 0 and 3.00.
- 16.5.3. If the front panel displays an error message, repeat step 16.5.1 and 16.5.2 up to a maximum of three times.
- 16.5.4. If three consecutive failures occur, then the unit fails its Sample Skipping test.
- 16.5.5. Record the results of this test on the data sheet.

16.6. Test 2 - skip -480 samples at pitch= 0

- 16.6.1. Press **RECORD 2**.
- 16.6.2. Verify that the ADAT front panel displays a value between 0 and 3.00.
- 16.6.3. If the front panel displays an error message, repeat step 16.6.1 and 16.6.2 up to a maximum of three times.
- 16.6.4. If three consecutive failures occur, then the unit fails its Sample Skipping test.
- 16.6.5. Record the results of this test on the data sheet.

16.7. Test 3 - skip +480 samples at pitch= +100

- 16.7.1. Press **RECORD 3**.
- 16.7.2. Verify that the ADAT front panel displays a value between 0 and 3.00.
- 16.7.3. If the front panel displays an error message, repeat step 16.7.1 and 16.7.2 up to a maximum of three times.
- 16.7.4. If three consecutive failures occur, then the unit fails its Sample Skipping test.
- 16.7.5. Record the results of this test on the data sheet.

16.8. Test 4 - skip -480 samples at pitch= +100

- 16.8.1. Press **RECORD 4**.
- 16.8.2. Verify that the ADAT front panel displays a value between 0 and 3.00.
- 16.8.3. If the front panel displays an error message, repeat step 16.8.1 and 16.8.2 up to a maximum of three times.
- 16.8.4. If three consecutive failures occur, then the unit fails its Sample Skipping test.
- 16.8.5. Record the results of this test on the data sheet.

16.9. Test 5 - skip +480 samples at pitch= -300

- 16.9.1. Press **RECORD 5**.
- 16.9.2. Verify that the ADAT front panel displays a value between 0 and 3.00.
- 16.9.3. If the front panel displays an error message, repeat step 16.9.1 and 16.9.2 up to a maximum of three times.
- 16.9.4. If three consecutive failures occur, then the unit fails its Sample Skipping test.

16.9.5. Record the results of this test on the data sheet.

16.10. Test 6 - skip -480 samples at pitch= -300

16.10.1. Press **RECORD 6.**

16.10.2. Verify that the ADAT front panel displays a value between 0 and 3.00

16.10.3. If the front panel displays an error message, repeat step 16.10.1 and 16.10.2 up to a maximum of three times.

16.10.4. If three consecutive failures occur, then the unit fails its Sample Skipping test.

16.10.5. Record the results of this test on the data sheet.

16.11. Press **EJECT** and remove the tape.

16.12. Press **PITCH Δ** and **PITCH ∇** simultaneously and verify that the ADAT front panel displays "SSt.".

16.13. Press **PITCH Δ** and verify that the ADAT front panel display reads "dONE."

16.14. Press **AUTOPLAY** and verify that the ADAT front panel displays "AdAt" or "----".

17. Audio Test

This procedure is a check of the audio in and out of the ADAT to verify that no noise related problems are present. The use of a mixer or cue amplifier is recommended along with a set of headphones. For information on audio related functions, see Section 3.7.2 through 3.7.4 of the ADAT Service Manual.

17.1. Connect the ADAT to the audio system used by the Service Center.

17.2. Insert a formatted tape into the ADAT

17.3. Press **SET LOCATE** and **LOCATE 1** simultaneously.

17.4. Place all 8 channels in record ready by pressing the **RECORD 1** through **RECORD 8** switches and verifying that the red LEDs are lit.

17.5. Press the **AUTO INPUT MONITOR** button and verify that the LED is lit.

17.6. Press the **FORMAT** button and verify that the LED is lit

17.7. Begin playing the audio source material

17.8. Verify that the audio source is being received by the ADAT by observing the meter bridge.

17.9. Press **PLAY** and then press **PLAY** and **RECORD** simultaneously.

17.10. Record at least 30 seconds of audio onto the ADAT.

17.11. Press **STOP** and then **LOCATE 1.**

17.12. Press **PLAY** and listen to the audio just recorded.

17.13. Verify the following for each Output channel.

- Audio is heard
- No distortion is present
- The playback level is the same as the recorded level
- The meter bridge is operating properly

17.14. Press **EJECT** and remove the tape from the unit.

17.15. Record the results of this test on the data sheet.

18. Loop Test

This test verifies that tape damage is not occuring in the ADAT. A section of tape is looped 100 times and then checked on an oscilloscope for errors or problems relating to envelope amplitude.

18.1. Part 1 - Looping

18.1.1. Insert a non-formatted tape into the ADAT. Note that the section of tape used for this test must never have been played in any other ADAT. If using an existing tape, locate the tape to a non-formatted section.

↳ The end of a formatted section, To perform a format extension?

18.1.2. Press **FORMAT**.

18.1.3. Press **PLAY** and **RECORD**.

18.1.4. While the tape is formatting, push **SET LOCATE** and **LOCATE 1** simultaneously at a convenient point on the tape (usually at a multiple of 60 seconds, such as 30 seconds).

18.1.5. After 30 seconds from the **LOCATE 1** position, press **SET LOCATE** and **LOCATE 2** simultaneously.

18.1.6. Press **STOP** 5 seconds after setting **LOCATE 2**.

18.1.7. Press **LOCATE 1**.

18.1.8. After the tape has stopped, press **AUTO 2>1** and then **AUTO PLAY**.

18.1.9. Press **PLAY**. The tape will now loop over the 30 second section of tape just formatted. The ADAT will loop this section 100 times and then stop.

18.2. Part 2 - Evaluation

18.2.1. Oscilloscope Set Up

18.2.1.1. Channel 1

- Place probe on Test Point 1 (TP1) of the Read-Pre 2 PCB.
- Set to 1.0 Volts/Div.
- Use AC Coupling
- Use the POSITION knob to set the GND trace to the second division line above the middle of the scope display.

18.2.1.2. Channel 2

- Place probe on Test Point 8 (TP8) of the Processor PCB.
- Set to 2.0 Volts/Div.
- Use DC Coupling
- Use the POSITION knob to set the GND trace on the first division line from the bottom of the scope display.

18.2.1.3. Trigger

- Same As Step 7.1.3

18.2.1.4. Vert. Mode

- Same as step 11.1.4

18.2.2. After the tape has been looped, hook up the oscilloscope probes as indicated above.

18.2.3. Push **PLAY** and observe both traces of the oscilloscope.

18.2.4. Count the number of errors observed over the looped area of tape.

18.2.5. Verify that the total amount of errors observed is less than 30.

18.2.6. Verify that no more than one error per second is displayed at the same spot on the oscilloscope.

18.2.7. Verify that the envelope does not contain drop outs when errors are observed on the oscilloscope.

18.2.8. Verify that the envelope amplitude does not decay over the loop period.

18.2.9. If any part of steps 18.2.5 through 18.2.8 is not verified, the unit fails its loop test. This unit must now go to Loop Rework.

18.2.10. Press **EJECT** and remove the tape.

18.2.11. Record the results of this test on the data sheet.

19. Preparation For Delivery

Perform the following steps prior to delivery of the unit back to the customer.

19.1. Place some Three Bond at the following places:

- R147 Pot on the Processor PCB
- R148 Pot on the Processor PCB

- R149 Pot on the Processor PCB
- LO EQ Pot on the Read Pre 2 PCB
- SLICE Pot on the Read-Pre 2 PCB
- Azimuth Adjustment screw on the Linear Head
- Concial screw
- Linear Head Height Adjustment Nut

Exercise extreme caution when applying Three Bond to any point in the transport. **DO NOT GET THREE BOND ON ANY PART OF THE DRUM ASSEMBLY.**

Figure E-1 - ADAT transport Top View

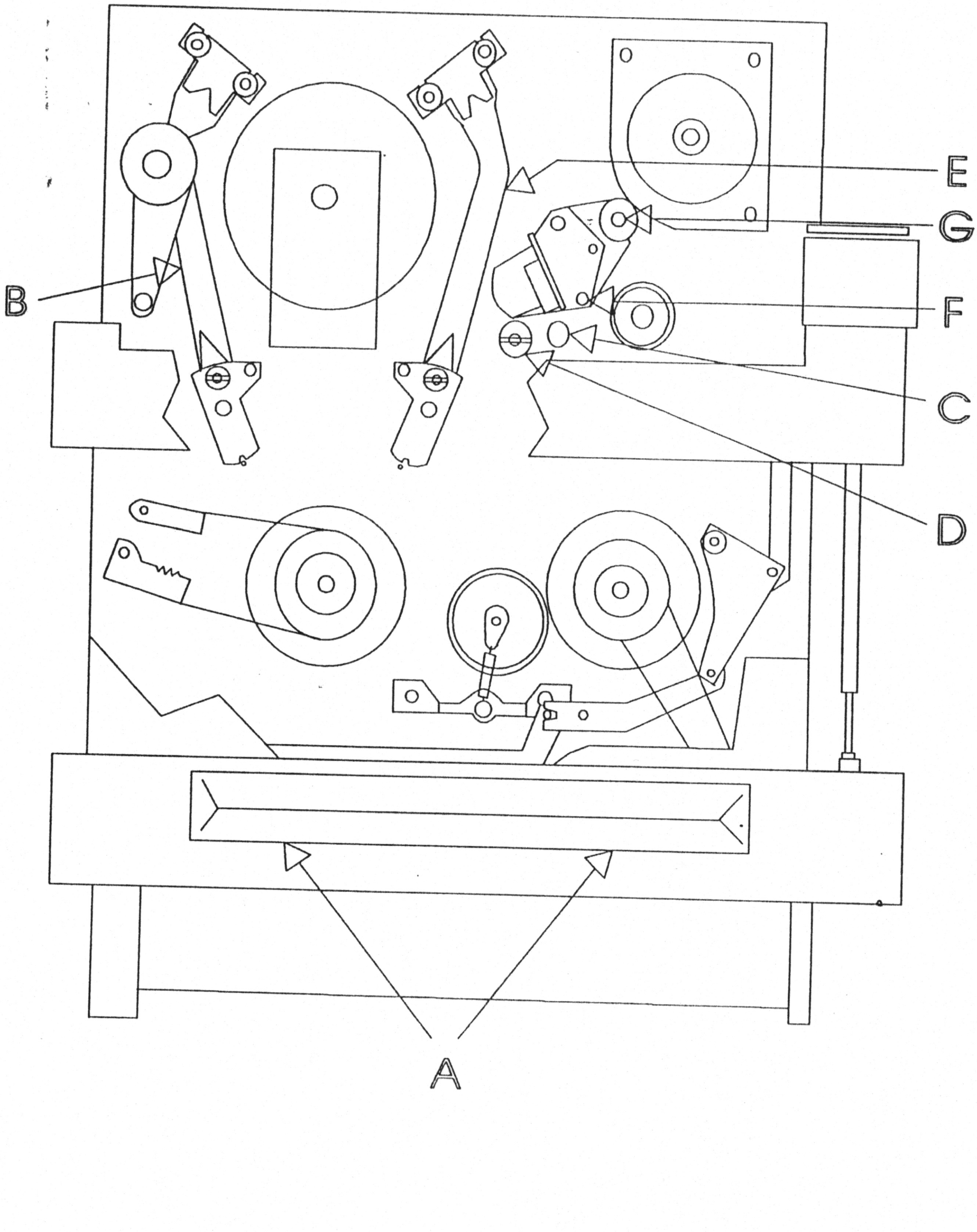
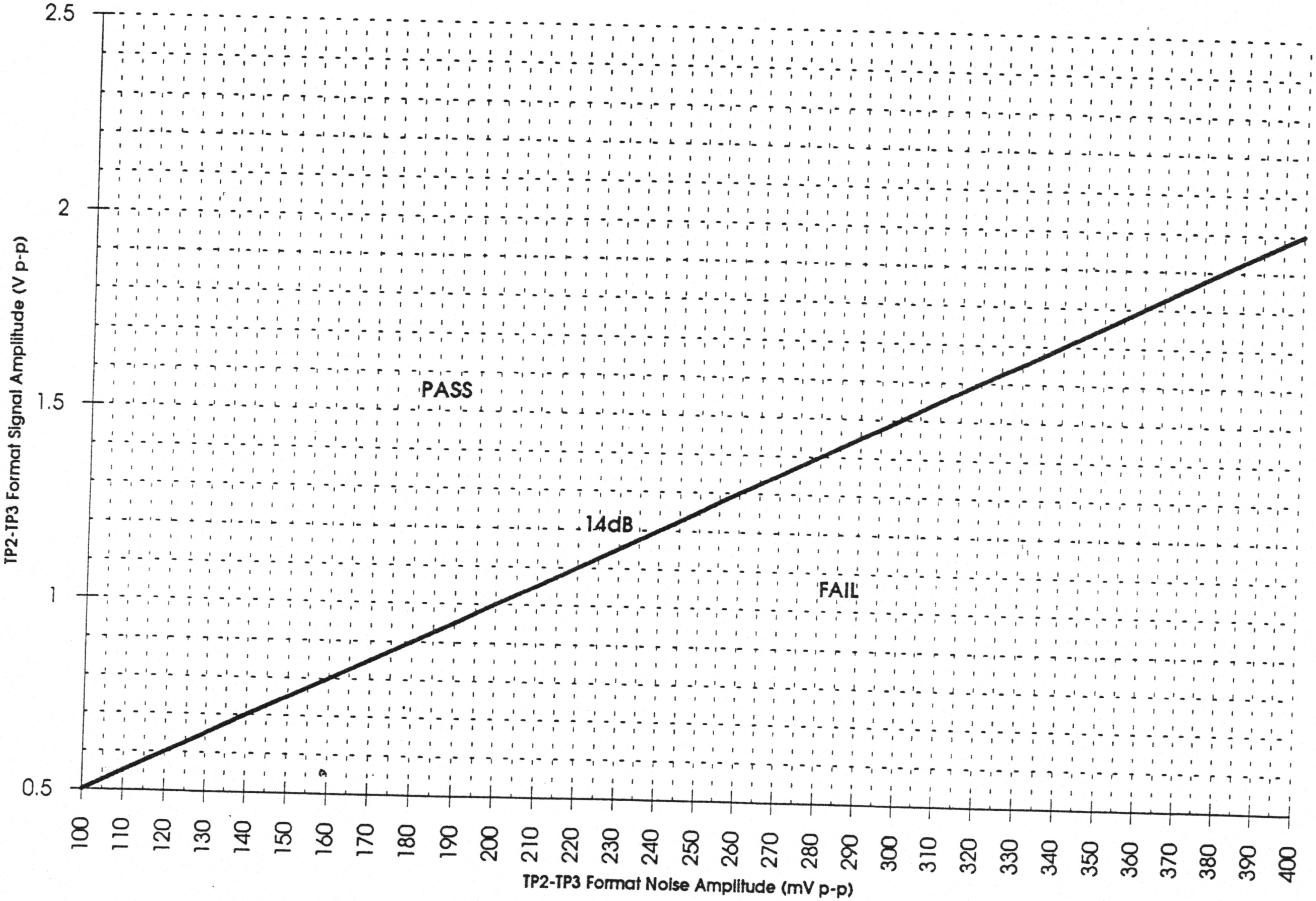


Figure 2
CROSSTALK



ADAT REPAIR SHEET

SERIAL NUMBER: AD25______________
Start Time: _____________

DRUM HOURS:_______
Finish time: _________

Complaint: ____
____
____

Repair Completed: ____
____
____
____
____

Hardware Mods

Indicate "Added" (Add), "Already Installed" (Inst) or "Not Applicable" (N/A)
Power Supply _____ Cap Mod _____ VCO Mod _____ Linear Head Mod _____
Lower Drum: New _____ Old _____ If New Lower Drum, Processor Board PCB Mod _____
Read Pre 2 Filter Mod _____
Software Installed: _____ Brake Resistors: R32 _____ R51 _____

QC TEST RESULTS

2.2 ROM Self Test: Pass ___ Fail ___
2.3 RAM Self Test: Pass ___ Fail ___
2.4 LED Self Test: Pass ___ Fail ___
2.5 Sync I/O Self Test: Pass ___ Fail ___
2.6 Front Panel Button Self Test: Pass ___ Fail ___
2.7 Back Panel Button Self Test: Pass ___ Fail ___
2.8 Digital I/O Self Test: Pass ___ Fail ___
3. Capstan/Pinch Roller Gap: OK ___ Adjusted ___
4. Cassette Load Test: OK ___ Adjusted ___
5. Bake Torque: Supply _____ Take Up _____
6.1 Write Protect Test: Pass ___ Fail ___
6.2 End Sensors Test: Pass ___ Fail ___
7.2 Drum Servo Voltage: _____
7.3 Capstan Servo Voltage: _____
8.2 WRCV Voltage: _____
9.2 P1 Alignment: OK ___ Adjusted ___
9.3 P4 Alignment: OK ___ Adjusted ___
10. Tape Tension: Pre Drum _____ Post Drum _____
11.2 Linear Head Voltage: _____
11.3 Envelope Flatness: OK ___ Adjusted ___
11.3.4 Envelope Amp: PG high _____ PG low _____
11.5 Envelope Deviation: OK ___ Adjusted ___
11.6 PG Delay Offset: _____ µsec
11.7 Final Check: OK ___ Adjusted ___
12.1.4 Crosstalk Fmt: PG Hi ____ PG Low ____
12.1.7 Crosstalk Plybk: PG Hi ____ PG Low ____

12.2.9 Envelope Gap: ____ µsec
13.2 Error Rate Minimization: ____ VCO Voltage ____
13.3 Read VCO Adjustment: Pass ___ Fail ___
14.8 Playback Error Rate: Pass ___ Fail ___
14.13 Punch-In Errors: Pass ___ Fail ___
14.15 Punch-In Playback Errors: Pass ___ Fail ___
15.1 Track Skipping Test 1: Pass ___ Fail ___
15.2 Track Skipping Test 2: Pass ___ Fail ___
15.3 Track Skipping Test 3: Pass ___ Fail ___
15.4 Track Skipping Test 4: Pass ___ Fail ___
15.5 Track Skipping Test 5: Pass ___ Fail ___
15.6 Track Skipping Test 6: Pass ___ Fail ___
16.1 Sample Skipping Test 1: Pass ___ Fail ___
16.2 Sample Skipping Test 2: Pass ___ Fail ___
16.3 Sample Skipping Test 3: Pass ___ Fail ___
16.4 Sample Skipping Test 4: Pass ___ Fail ___
16.5 Sample Skipping Test 5: Pass ___ Fail ___
16.6 Sample Skipping Test 6: Pass ___ Fail ___
17.13 Audio Test: Audio is heard: Pass ___ Fail ___
No Distortion heard: Pass ___ Fail ___
Playback Level OK: Pass ___ Fail ___
Meter Bridge working: Pass ___ Fail ___
18.2.5 Loop Test: Number of errors observed _____
18.2.6 More than 1 error/second: Pass ___ Fail ___
18.2.7 Envelope drop outs: Pass ___ Fail ___
18.2.8 Envelope decay: Pass ___ Fail ___

19. Preparation for delivery: Three Bond Applied ________

BRC TEST ROUTINES

AUTO-TEST MODE: Holding the record1 and record8 switches during power-on will place the BRC in test mode. After any test fails, the bottom line of the display will read "Test Failed". To continue with the remaining tests, press the PitchUp button while holding the PitchDn button. The BRC test routines are currently as follows:

Test 0: ROM Test

Both processor and external ROM checksums are calculated and compared with the checksum programmed into each ROM.

Test 1: RAM Test

Checks RAM integrity (i.e. writes then reads back data). This test is non-destructive.

Test 2: LED Block Test

Blocks of LEDs (track, track control, display, edit, and transport blocks) are lit one at a time.

Test 3: LED Cycle Test

Each LED is individually lit. To abort this test, press the PitchUp button while holding the PitchDn button.

Test 4: Switch Test

Used to check switch connections of front panel switches as well as the back panel switches (footswitch1, footswitch2). As each switch is pressed, its name is displayed.

Test 5: LRC Test

Used to check back panel footswitch connections using a rotary resistor box. If an LRC is not connected the display will read “Unplugged”. The bottom line of the display will indicate the footswitch (Footswitch1 = Loc/Play footswitch, Footswitch2 = Punch footswitch) and value. Values are defined as follows:

1= LRC plugged in
2= Record
3= Fast Forward
4= Rewind
5= Stop
6= Play
7= Play/Record
8= Play/Forward
9= Play/Rewind
10= Play/Stop
11= Set Locate
12= Auto Play
13= Locate 0
14= Locate 1
15= Locate 2
16= Auto 2->1
17= Auto Input
18= All Input
19= Footswitch

Test 6: MIDI In/Out Test

Must connect MIDI cable from MIDI In to MIDI Out port. Checks the serial output of the MIDI Out port and the serial input of the MIDI In port.

Test 7: 48K Clock In/Out Test

Must connect 48K output to 48K input. Checks the 48K clock input and output circuitry.

Test 8: Video Sync Test

Checks for incoming video signal and flashes the type encountered PAL/SECAM or NTSC)

Test 9: SMPTE In/Out Test

Must connect SMPTE output to SMPTE input. Checks the SMPTE in/out circuitry. If there is good SMPTE, then the tape counter will reflect the SMPTE being generated and read. If there is no SMPTE or bad SMPTE, the tape counter will display dashes.

SELECTIVE TEST MODE: Holding the record1 and record7 switches during power-on will place the BRC in a selectable test mode. A test menu is displayed and the various tests may be selected using the numeric keypad. To execute the currently displayed test, press the Auto Play button. To exit the current test and return to the test menu, press the PitchUp button while holding the PitchDn button.